VOLUME 39
NUMBER 2

FEBRUARY, 1952

plating

POSTMASTER: IF UNDELIVERABLE RETURN TO
5800 N. MERVINE ST., PHILADELPHIA 41, PA.
RETURN POSTAGE GUARANTEED

PEN FINISHING

See Contents Page 139

CLEPO 19-D

For Defense Production

In the Air

A time-proven Barrel Deburring Compound for tumbling Steel prior to Phosphate Coating.

CLEPO 19-D has been in poduction use for ten years, Removing Burrs and preparing Steel for type II finish. class A. B and C of U.S. Army Spec. 57-0-2C.

For detailed technical information see page 15 of Clepo Cleaning Catalog.

On the Sea

On the Ground

CLEPO — CLEANING COMPOUNDS

FREDERICK **GUMM** *Chemical Company Inc.*

538-542 Forest St., Kearny, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 200.

NEW RESEARCH PRODUCTS FOR METAL FINISHING

STRIP ANODIC COATINGS ON ALUMINUM AT ROOM TEMPERATURE

ENTHONE COMPOUND 89 is an alkaline material that strips anodic coatings on aluminum at room temperature. Simply immerse anodizing racks or defective work in cold solution of Compound 89 for 15 seconds to strip oxide coatings. No chromates present to contaminate anodizing solution. Can be put in steel tank or crock.

PHOSPHATE AND CLEAN IN ONE OPERATION

ENTHONE COMPOUND 39 is a new product for ***rapid*** cleaning and phosphating. Adherent phosphate coatings are formed in from 15 seconds to 1 minute through a wide temperature range. Cuts cost, rejects and labor for preparing steel and zinc for painting or enameling. A simple test will prove to you that phosphating of oily work can be done in one tank. Material cost of phosphating is less than 1½¢ per square foot.

APPLY CHROMATE COATINGS TO ZINC AND CADMIUM AT LOW COST

"ENTHOX" CHROMATING PROCESS is a new simple procedure for chromate coating of zinc and cadmium. Use only 1 oz./gal. of material and chromate troublefree even in fully automatic cycles. Solution costs 4¢ per gallon to make. Coatings can be dyed various shades of color including black and red. Meets U. S. Army Specifications 57-0-2C and 51-70-1A.

Write for bulletins on these processes and a check list of literature on sixty products for modern metal finishing.

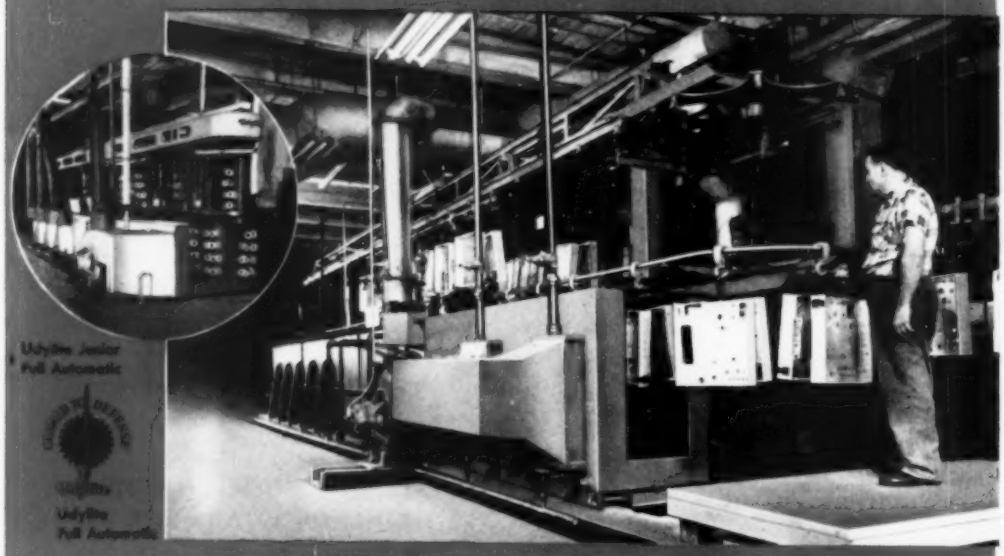
METAL FINISHING PROCESSES

ENTHONE
INCORPORATED
442 ELM STREET
NEW HAVEN, CONNECTICUT

ELECTROPLATING CHEMICALS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 201.

Udylite FULL AUTOMATICS SPEED VITAL DEFENSE PLATING



Versatility in Mass Production Proven by Palumbo Bros. Inc., Newark, New Jersey

Whether your plating requirements are geared to strict in-line specialization or job shop diversification, Udylite Full Automatic Plating Machines match today's rigid defense production specifications.

Here, for example, Palumbo Bros. Inc., Commercial Electroplaters of Newark, New Jersey, prove *full automatic* plating production outstandingly efficient and profitable for diversified job shop operations with Udylite Full Automatic and Junior Full Automatic Plating Machines.

Mr. John R. Palumbo, a principal in the firm, writes, *"Our Udylite Automatic Plating Machines truly represent the ultimate in mass production plating. Superior uniform quality is achieved with great savings in man hours, enabling us to enjoy a competitive advantage in job plating. Currently, the majority of parts processed in our zinc and cadmium machines are earmarked for Defense."*

Developing to its present size through aggressive planning, the Palumbo Bros. Inc., has become one of the leading and most modern electroplating establishments in the East. Swift, sure automatic production is the answer!

No matter what your plating problems are, Udylite is prepared to show you how your operation can realize greater production . . . *high volume of high quality at the lowest possible cost* . . . by installing the better way of plating — Udylite Full Automatic Machines.

Call in your Udylite Technical Man today or write Udylite direct. No obligation either way.

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 202.

Industry News

Northwest Chemical Company, Detroit 4, Mich., announces the appointment of **Johnson Sales Company,** Montclair, N. J., as its Middle Atlantic States representative.

Johnson

With a chemical degree from Johns Hopkins University and special courses in physical chemistry and electroplating at New York University, Howard F. Johnson, the principal of the latter organization, has had experience in the chemical, smelting and refining industries, holding executive positions with such companies as American Smelting & Refining Company, Nichols Copper, Phelps Dodge Corporation and Lotte Chemical Co.

Buckeye Products Licenses South African Company. It was recently announced by The Buckeye Products Company, Cincinnati, that arrangements have been concluded for a licensing agreement with **Industrial Chemical Products, Ltd., Pty.,** Johannesburg, South Africa, whereby the latter will manufacture the complete line of Speedie Buffing and Polishing Compositions for both South Africa and the Rhodesias.

Graham, Crowley & Associates, Inc., has recently enlarged its research and development laboratories in Chicago, the second such move within a year. This division of the company is largely devoted to research in the field of primary and secondary batteries, electrolytic recovery of rare metals, and electro-organic processes.

The United Buff Products Corporation of Passaic, N. J., manufacturers of the Pressure-cooled Airflow Buff, has announced the appointment of several regional distributors: **Industrial Machinery, Inc.,** 501 N. Cortez St., New Orleans 19, La., for Louisiana and Mississippi; **R. L. Hundley Company,** 3100 W. Walnut St., Milwaukee 8, Wis., for Minnesota and Wisconsin, and **Thomas Buff & Brush Company, Ltd.,** 174 Catherine

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years 50c per copy; Foreign, $8.00 per year, $1.00 per copy.

...increase the life expectancy of costly equipment with... SARAN RUBBER TANK LINING

Saran rubber, one of Dow Chemical's superior developments in tank linings, has combined the physical properties of rubber with the chemical resistance of saran. This high degree of chemical and abrasive resistance makes saran rubber an outstanding lining where resistance to grease, many solvents, acids and other chemicals is indicated.

Saran rubber can be applied easily, effectively and economically by experienced tank lining applicators located strategically throughout the country.

Get in touch with an applicator today by contacting your nearest Saran Lined Pipe Company office —and find out how you can preserve the life of costly equipment.

Write to the Distributor:
DEPARTMENT PL 209
Saran Lined Pipe Company
2415 BURDETTE AVE. • FERNDALE, MICHIGAN
Offices in: New York • Boston • Philadelphia • Pittsburgh
Chicago • Tulsa • Indianapolis • Houston • San Francisco
Los Angeles • Portland • Cleveland • Denver • Seattle
Charleston, S.C. • Toronto

SARAN RUBBER a DOW product

St., No., Hamilton, Ont., Canada, for the Province of Ontario.

The company has also established a sales office at 319 Illinois Oil Building, 8th Ave. at 24th St., Rock Island, Ill., from which T. "Tom" Means services Iowa and Nebraska and Willard H. "Bill" Johnson, northern Illinois. A new Michigan branch is located at 18550 Grand River Ave., Detroit 3, Mich. It is headed by C. A. "Art" Hubley. Resident sales engineers will be based in Grand Rapids, Mich.

Oakite Service Representatives Hold Annual Technical-Sales Conference. Field representatives from the Cleveland, New England, New York and Philadelphia sales divisions of Oakite Products, Inc., are shown gathered for a series of

technical sales conferences at the Hotel Statler in New York City on November 29-30 and December 1. Featured subject of discussion was the role of cleaning and allied procedures in defense and civilian production. Also heard were reports on new developments. Similar conferences were held in San Francisco and Chicago during November.

Duggan Masking Devices, Detroit 16, Mich., announces the opening of a new addition to its plant at 2030 W. Fort St., which will increase the company's manufacturing floor space by almost 4,000 sq. ft.

The company is engrossed in defense production at this time, and the additional facilities are needed to maintain delivery schedules for planting racks and masks for regular civilian customers as well as for production masking devices for ordnance material.

Pennsalt Completes Sales Division Reorganization. The Pennsylvania Salt Manufacturing Company has completed a reorganization of its Sale Division designed to consolidate sales administration while retaining specialization essential to the company's diversified interests.

The line organization of the Sales Division is headed by Russell S. Boehler as General Sales Manager. Mr. Boehler previously was an Assistant General Sales Manager, a position now eliminated. Reporting to him are Albert H. Clem as Field Sales Manager, Edwin S. Gutverich as Manager of Technical Service, and the eight department sales managers.

Mr. Clem, formerly Sales Manager of the Industrial Chemicals Department, will be responsible for all district sales

CUTMASTER

Cuts Costs

On Automatic Buffing

WILLIAMSVILLE BUFF DIVISION
EST 1893 A1 ®
DANIELSON CONNECTICUT

CUTMASTER by Williamsville is precision-designed for automatic buffing—cut on the bias for longer wear—engineered for cool-running and perfect balance to give extra hours of trouble-free service. Ask us to show you how CUTMASTER can cut costs on your automatic buffing jobs now!

WILLIAMSVILLE BUFF DIVISION
The Bullard Clark Company
DANIELSON, CONNECTICUT

SALESMAN or SALES MANAGER

Reputable manufacturer and distributor of Plating and Polishing equipment and supplies, established 30 years, representing the most prominent manufacturers, requires a gentleman to act as Sales Manager. This party must be presently employed by a reputable concern in our line as salesman or sales manager and be desirous of making a new connection. The man we want is to act as Sales Manager and naturally must have the necessary qualifications. An excellent opportunity offered by a Midwestern Company. Reply by whom employed the last 10 years, how long by each, married or single, age, weight, height and if possible, include snapshot. All information will be held strictly confidential.

Reply to:

P-252-A, PLATING
P. O. Box 168, Jenkintown, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE # 204.

IMPROVED

and superior by every standard of comparison . . . and costs less!

MICCROSOL

E-1003

HEAT-CURED RACK COATING

● Now, the Michigan Chrome and Chemical Company laboratories have improved their single-dip heat-cured rack coating which offers, in addition to positive insulation and protection: (1) amazing tensile strength and scuff resistance; (2) permanent flexibility; (3) positive and continuous adhesion; (4) simplicity of application; (5) savings in time, labor, and material . . . a major objective of chemical engineers for years.

● Exhaustive tests reveal the marked superiority of Improved MICCROSOL E-1003 in every important manner of comparison. In addition to the outstanding characteristics listed above, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show superior performance in comparison to similar products.

● Improved MICCROSOL E-1003 is a 100% solids non-evaporating material that produces a smooth, tough, leather-like coating with a single application which will often outlast the life of the rack. Racks are completely processed and ready for use in approximately 2 to 4 hours.

● Has exceptionally high gloss, allowing free drainage and no solution carry-over.

● If you are not prepared to coat your racks, write us and we will be glad to furnish the name of the applicator nearest you who is equipped to apply Improved MICCROSOL E-1003 Heat-Cured Rack Coating.

It's Improved in Every Respect!

Write for detailed bulletin.

MICHIGAN CHROME
and Chemical Company
6351 East Jefferson Avenue • Detroit 7, Michigan

MICCRO Products

Developed and Manufactured by

STORTS EXHAUST SYSTEMS
pay their way in long life utility

A PROPERLY DESIGNED and expertly fabricated exhaust system is a necessary part of your production equipment. It protects plant and machinery, keeps the air fresh and the workers healthy. When you plan exhaust installations make sure of sufficient capacity and—if you have corrosion conditions—that your construction materials are suitable. If in doubt, consult Storts engineering staff. They are right up to date on exhaust system design.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 206.

BRASS PLATING BY TRUE BRITE

NEW Free Bulletin on brass plating is now ready. Write or call for your copy.

Test Brass Thickness the new, easy way. Insure uniform plate and avoid rejects. True Brite Brass Thickness Testing is as simple as the cadmium and zinc thickness dropping tests but uses a special reagent.

No shortage of Brass plating chemicals here. True Brite Brass Makeup Solution and True Brite Brass Maintenance Solution are ready for immediate shipment. Simplify your brass plating by using these complete additions.

Copper Concentrate will solve your copper cyanide shortage. Now ready for immediate shipment in any quantity at prices you can afford.

TRUE BRITE CHEMICAL PRODUCTS CO.

P. O. Box 31, Oakville, Conn.

Practical Products for Practical People

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 207.

Industry News

offices. Mr. Garverich formerly was Manager of Technical Service on Specialties.

The planning organization for the Sales Division is headed by Arthur G. Tunstall, Jr., as Manager of Marketing. Mr. Tunstall also was previously an Assistant General Sales Manager. Reporting to him are Paul C. Hurley, Manager of Sales Promotion; Franklin A. Lucard, heading the new department of Sales Development, and Malcolm J. Harkins in the new position of Manager of Sales Control.

George D. Grogan, formerly an Assistant to the Vice-President in Charge of Sales, was named Sales Manager for Industrial Chemicals, replacing Mr. Clem. Joseph J. Duffy, Jr., was named Sales Manager of the Fos Products and Industrial Cleaners Department, a new department formed from consolidation of the former Fos Products Department and Special Chemicals Department.

Robert R. Pierce was appointed Sales Manager of the newly formed Corrosion Engineering Products Department. He was formerly a Products Supervisor on Pennsalt's corrosion resistant cements and paints, which were marketed by the Industrial Chemicals Department. Edward M. Wilson, formerly an Assistant to the Vice-President in Charge of Sales, was appointed Manager of the Government Sales Department.

Stonhard to Occupy Phils Ball Park. Part of the old Phillies Ball Park, at the northwest corner of Broad and Huntingdon, Philadelphia, will be improved with a $600,000 one-story building to house the Stonhard Company's offices, warehousing and manufacturing facilities. The building will contain 42,000 square feet. Part of the tract will be for parking.

The firm's products include materials for floor repair and resurfacing, masonry waterproofing, and roofing.

Clover Manufacturing Company, Norwalk, Conn., has just completed a new building with 30,000 sq ft of floor space to handle the increased demand for its coated abrasives, grinding and lapping compounds.

Gerity-Michigan Corporation, a leader in the plating and finishing industries, expects to be in production soon on a contract from the Detroit Ordnance District for hard-chromium plating of Army cannon tubes. A $500,000 addition to the company's Adrian plant, to be used for the cannon-tube plating operation, is under construction.

Also under construction at the Adrian plant is a new building in which the company will produce sand-mold magnesium castings, under a United States Air Forces contract, for various aircraft-engine manufacturers.

Isn't **NOW** a good time to ask yourself these questions about Soak Tank Metal Cleaning?

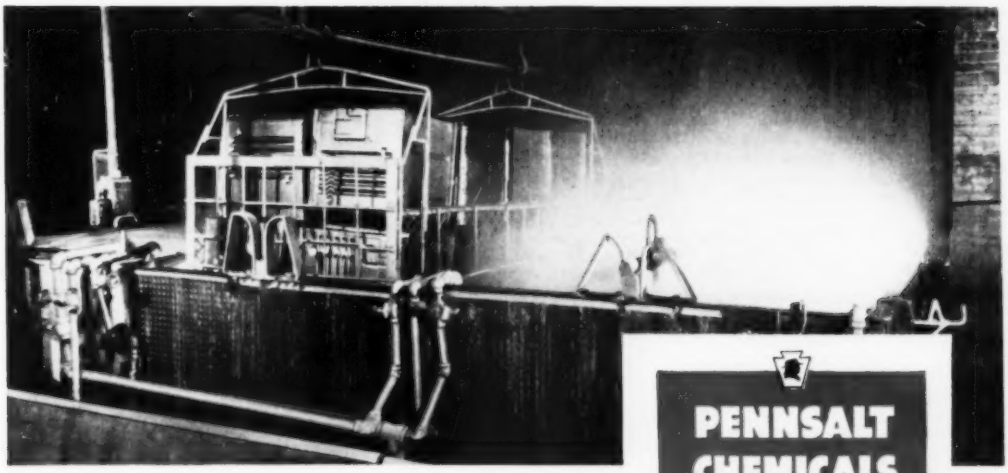
1. Is my present cleaner as good as that used by other leaders in my manufacturing field? Have I reviewed today's trade practices recently for the best all-around results from cleaning?
2. Is my cleaner based on *fused* alkalies that dissolve quickly and completely—or do I really get only "halfway" efficiency?
3. How about anhydrous, active ingredients? Am I actually paying freight and storage on water and fillers?
4. Will my present cleaner still give good results under such tough conditions as low temperature . . . heavy soil load in the tank . . . overlong periods between recharging? Or must I figure on rejects?
5. Will it tackle such difficult jobs as removal of heavy grease load . . . compounded and impacted soils . . . buffing compound . . . and still rinse free and clear?
6. Do I get the kind of qualified technical assistance from my supplier that I need to get the optimum results from cleaning?

You can get help on all these problems with Pennsalt Metal Preparation Service

If you have any doubts about any of these questions your answer lies in Pennsalt Metal Preparation Service.

Here you will find a complete line of soak tank cleaners which are in use in the country's leading plants . . . performing tough jobs well . . . holding down rejects.

Here—more important—you will find a friendly, qualified representative, sincerely anxious to help you. Worth looking into? Pennsalt Metal Preparation Service, Pennsylvania Salt Manufacturing Co., Philadelphia 7, Pa.



PENNSALT CLEANERS...A BETTER START FOR YOUR FINISH

whether your product must be finished for corrosion resistance or paint adherence, or with eye-appealing brightness or in a variety of attractive colors, ... there's an IRIDITE to do the job!

Zinc, cadmium, aluminum, copper, brass or bronze, in their usual commercial forms, can be finished with Iridite for a fraction of a cent per square foot . . . and without costly special equipment or personnel training. In addition, our ARP plating chemicals . . . brighteners, addition agents, etc. . . . can increase the efficiency of your plating solutions prior to Iridite treatment.

Let the experience of our field engineers and laboratory specialists be your guide to the solution of your specific finishing problem.

We'll welcome the opportunity to work with you in the development of new materials as new finishing problems arise from your manufacturing plans. *Write for information, or send samples of your product for free test processing.*

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.

REPRESENTATIVES IN PRINCIPAL INDUSTRIALS C[illegible]; [illegible] E. H. SUTCHER COMPANY
Manufacturers of Iridite Finishes
Are Corrosion Resistance and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals.

Personals

Dr. William Blum, internationally known for his contributions to the field of electrochemistry, has retired as Chief of the Electrodeposition Section of the National Bureau of Standards after 42 years' service.

Blum

Dr. Blum was born in Philadelphia, Pa., in 1881. He received a B.S. in chemistry in 1903 and a Ph.D. in chemistry in 1908 from the University of Pennsylvania. From 1903 to 1909 he was an Instructor and Assistant Professor of chemistry at the University of Utah, teaching general, analytical, and physical chemistry.

His many technical papers reflect his contributions to the field of electrodeposition. He is the author of chapters in several corrosion handbooks and of the revised third edition of the text, "Principles of Electroplating and Electroforming" as well as of technical articles.

Dr. Blum is an honorary member of the Electrodepositors' Technical Society, of England, and of the American Electroplaters' Society. He received the Medal of the Institute of Chemistry for Distinguished Governmental Service in 1926 and the Acheson Medal of the Electrochemical Society in 1941.

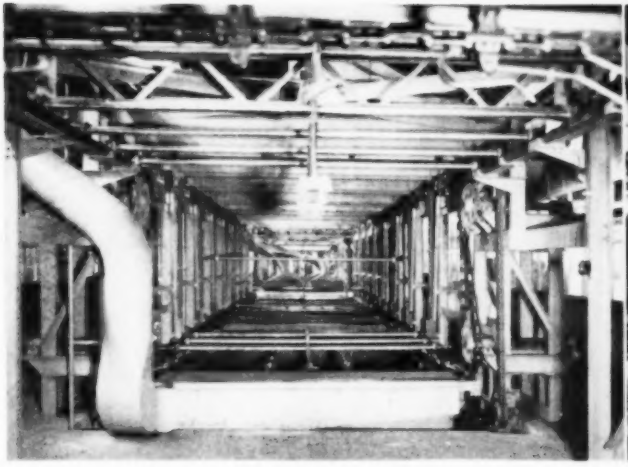
Dr. Abner Brenner has been appointed Chief of the Electrodeposition Section of the National Bureau of Standards, where he has been engaged in electrodeposition research since 1930, except for two years spent in NBS laboratories in California.

Brenner

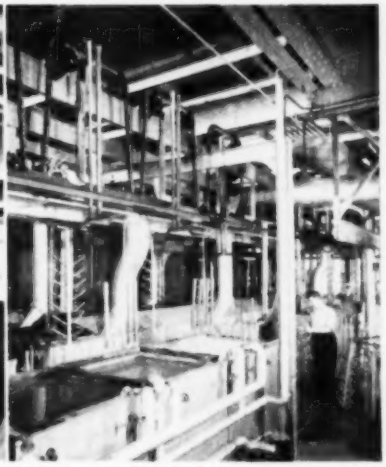
He has conducted extensive investigations on alloy deposition, especially tungsten and molybdenum with iron, nickel and cobalt, and on the nature of cathodic films.

A native of Kansas City, Mo., Dr. Brenner received a B.A. in chemistry from the University of Missouri in 1929, a M.S. in chemistry from the University of Wisconsin in 1930, and a Ph.D. in chemistry from the University of Mary-

in your plating **How to Get** **Greater Production**
Improved Quality
Better Working Conditions

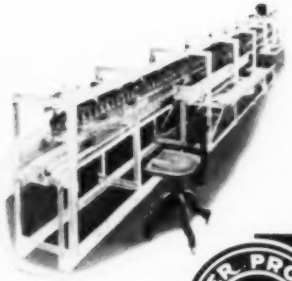


Typical Meaker Straight A-Way Automatic Plating Machine. This type unit is designed to handle 125 racks or more per hour.



Meaker Return-Type Automatic Plating Machine for chromium plating the large variety of parts in a high-quality line of plumbing hardware. Machine may be designed to copper plate, nickel plate and chromium plate in one continuous line.

A Meaker Semi-Automatic Plating Machine for use in medium-output plating departments and also for supplementing the plating operations in a Full Automatic which performs the cleaning, preplating operations, final rinsing and drying.



A special machine designed by Meaker for cleaning and silver plating small, brass contact clips.

You Get All Three with Meaker

Here's how! A Meaker plating machine makes every operation in the plating sequence automatic, or as mechanized as possible. This cuts to a minimum the manual handling of the parts in process—increasing production. The control of the quality of the plating is set and practically independent of the varying human element. A Meaker plating machine does clean up the plating room making for safer and more agreeable working conditions. And a bonus—in many cases the savings in the over-all plating costs have paid for the equipment in a short time.

Look to the handling methods in your plating department. You might be surprised what modern methods will accomplish. Whatever your requirements—full automatic, semi-automatic, or a special machine—Meaker has the answer.

MEAKER PRODUCTS

Serving the Plating Industry for Over 50 Years

THE MEAKER COMPANY

1639 South 55th Avenue, Chicago 50, Ill. • Telephone Bishop 2-1920

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 210.

Lead
Tin
Copper
Cadmium
Iron
Nickel

B&A FLUOBORATE PLATING SOLUTIONS GIVE YOU *These Big ADVANTAGES*

The standout performance of B&A Metal Fluoborates in lead, tin, iron, copper, cadmium and nickel plating is enabling platers to increase production while effecting real savings in critical metals.

In addition B&A Fluoborates provide a host of important advantages not available in other plating agents. *In alloy plating*, for example, they offer the only fast efficient way to plate lead-tin and lead-tin-copper alloys—simultaneously—with the ratios easily controlled. *In cadmium plating*, outstanding results are obtained *without* the hydrogen embrittlement common to other methods. *In lead and tin plating*, they produce coatings of excellent solderability—particularly after aging.

Yes, all these advantages *and more* are offered by B&A Metal Fluoborates. Learn more about them without delay. For operating data, experimental or commercial quantities—or for free technical consultation—write or phone the nearest B&A office listed below.

B&A Fluoborate solutions offer an unusual combination of advantages for increased efficiency, including:

1. **No mixing or dissolving necessary . . . supplied in concentrated solution form.**
2. **Easier bath preparation**
3. **Stability of bath composition**
4. **Ease of control**
5. **Practically 100% anode and cathode efficiencies**
6. **High conductivity**
7. **Good covering power**
8. **Fine-grained deposits of good color**
9. **Faster, high-speed operation**

AND MANY MORE—

In addition to these general operating advantages, each fluoborate bath has a number of special advantages for its particular applications.

REAGENTS B&A STANDARD OF PURITY FINE CHEMICALS

BAKER & ADAMSON *Fine Chemicals*
GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

Offices: Albany • Atlanta • Baltimore* • Birmingham* • Boston • Bridgeport* • Buffalo* Charlotte* • Chicago* • Cleveland* • Denver* • Detroit* • Greenville (Miss.)* • Houston* Jacksonville • Kalamazoo • Los Angeles* • Minneapolis • New York* • Philadelphia* Pittsburgh* • Providence* • St. Louis* • San Francisco* • Seattle • Yakima (Wash.)
In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.
In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver*
SETTING THE PACE IN CHEMICAL PURITY SINCE 1882
* Complete stocks are carried here.

Personals

land in 1939. He received a research fellowship from the University of Wisconsin in 1930 and the Procter award for the best papers presented to the 1946 and 1948 annual conventions of the American Electroplaters' Society.

Dr. Brenner is the author of many technical papers in the electroplating field on such topics as the corrosion-preventive values of electroplated coatings and the magnetic methods for measuring the thickness of electroplated coatings. He is the inventor of the magnegage and of the spiral contractometer.

Dr. Earl J. Serfass, Professor of Chemistry of Lehigh University, is now Head of the Department of Chemistry.

Serfass

. He graduated from Lehigh in 1933, received his Master's degree there in 1935, and his Ph.D. degree in 1938. Before joining the Lehigh faculty, he was associated with the Textile Foundation and the National Products Company. He has developed several commercial electronic devices for chemical analyses, and is Project Director of Project No. 2 of the Research Committee of the American Electroplaters' Society.

R. P. Ganchan has been appointed to head activities of Arco Rubber Processors' new Houston plant, a division of Automotive Rubber Company, Inc., Detroit, Mich.

Ganchan

Ganchan is a native of Beaumont, Texas, and graduated from Rice Institute in 1940 with the degree of Mechanical Engineer. Following service with the Armed Forces, he became associated with Standard Brass & Manufacturing Company as sales engineer.

Harry Amedro is now Syracuse and Western New York representative of the Northwest Chemical Company, Detroit, Mich.

Amedro attended Syracuse University, where he majored in chemistry, while employed in Allied Chemical & Dye Corporation's works laboratory, then covered New York State as a special representative for General Foods Corporation, and later the same territory plus parts of Pennsylvania for the DuBois Company of Cincinnati, Ohio.

E. G. Staley Maxwell has been appointed Manager of the General Electric Company's Charleston, W. Va., apparatus sales office, and **John H. Pharis, Jr.,** has been named to Maxwell's former post as Manager of the firm's Roanoke, Va., office.

Maxwell, who will have responsibility for the company's offices at Charleston, Roanoke, and at Bluefield, W. Va., succeeds **James J. Fitzgibbon,** who now is Manager of the apparatus sales office in Washington, D. C.

A native of Richmond, Va., Maxwell joined G. E. in 1936 after his graduation from Virginia Military Institute. Two years later, he was transferred to Philadelphia, where he served on industrial and general sales assignments for nine years. In 1947, he was named manager of the Roanoke office.

Pharis, a native of Martinsville, Va., is a graduate of Virginia Polytechnic Institute. He joined General Electric in 1933. Following a series of assignments in service engineering and application engineering, he joined the sales force of the Roanoke office in 1945.

Phillip Millard, native Detroiter and University of Detroit engineering graduate, has resigned as Materials Engineer of the Detroit Arsenal to join the sales-engineering staff of Automotive Rubber Company, Inc., Detroit, Mich.

COATING THAT HELPED SPEED UP PLATING

Properties of **UNICHROME COATING 218X** *pay off once again—reducing hard chromium plating time*

● A steel company, when hard chromium plating the rolls used in its mill, made an important saving with Coating 218X. By baking this green plastisol insulation onto the roll-holding racks, a substantial increase in plating speed was made possible. Ability of Coating 218X to maintain tough, unbroken protection slashed the current formerly lost by chromium depositing on the racks.

Tough yet flexible, Coating 218X can take use and abuse without cracking or tearing, without forming pockets or blisters. It has superior resistance to chemicals and requires just one prime coat for unsurpassed adhesion in all plating cycles—vapor degreasing included. Result: Longer-lasting, therefore more economical, insulation.

United Chromium's service engineers can give you helpful tips on better rack protection. Call them in. Or write us for names of nearby authorized appliers of Unichrome Coating 218X.

UNICHROME COATINGS for METALS

Metallic · Organic · Decorative · Protective

Products of UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y. • Detroit 20, Mich. • Waterb., 20, Conn. • Chicago 4, Ill.
Los Angeles 13, Calif. • In Canada: United Chromium Limited, Toronto, Ont.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 212.

Personals

Millard's background includes experience as rubber engineer with both Chrysler Corporation and Briggs Manufacturing Company.

P. N. Burkard, former Director of Technical Service for the J. B. Ford Division of Wyandotte Chemicals Corporation, now heads the company's Industrial, Railroad and Aircraft Department, succeeding **Dr. Roy Heath**. **Donald E. Anderson**, former Assistant Director of Technical Service, now heads the department.

Burkard joined the research staff of Wyandotte Chemicals in 1938, transferred to the J. B. Ford Technical Service Department in 1941, and became its Director in 1946. He is a graduate of University of Illinois, holds a Master's degree in chemistry from Syracuse University, and has done additional graduate work at Wayne University in Detroit.

Anderson has been a member of the following Wyandotte Chemicals departments since joining the company in 1940: research, plant research, development, technical service and engineering, and has been Assistant Director of Technical Service for several years. He is a chemical engineering graduate of Yale University.

L. W. Reinken, Chief Engineer of W. Green Electric Company, Inc., was elected chairman of the Metallic Rectifier Section of the National Electrical Manufacturers Association at a recent meeting in Cleveland.

William P. Matthew has joined the Technical Research Staff of Gotham Manufacturing Company, Providence, R. I. He will deal with the metallurgy and the finishing of parts in their defense contract. Mr. Matthew was formerly Metallurgist of Whiting Machine Company, Whiting, Mass., and of Comstock & Wescott, Boston, Mass.

J. W. Haines, Technical Service Representative of Oakite Products, Inc., is shown here receiving the D. C. Ball Award

for Distinguished Service from **John A. Carter**, Oakite President, as Sales Manager **Frank L. Oldroyd** looks on.

Obituaries

✣ **Aubrey J. Sidford**, retired Vice-President and member of the board of directors of Behr-Manning Corporation, passed away November 14, 1951. He had been in ill health since his retirement in 1945.

Sidford was one of the leaders and developers of the coated abrasive industry. He had planned to retire at the age of 65, but stayed on during World War II when he was needed.

✣ **Dr. James G. Vail**, retired Vice-President of the Philadelphia Quartz Company, Philadelphia, died on December 11 in New Delhi, India, where he was working at the Friends International Center for the American Friends Service Committee. He was 65.

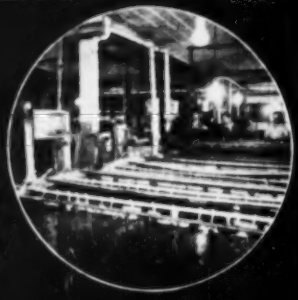
Dr. Vail joined the Philadelphia Quartz Company in 1905 as a chemist. He became Chemical Director in 1931 and Vice-President in 1940. Several years ago he began a gradual retirement from the business but continued to serve as a member of the Board of Directors.

An authority on soluble silicates, his first American Chemical Society Monograph, "Soluble Silicates in Industry", was published in 1928. For this and his many other publications and lectures on silicates, he was awarded the Chemical Industry Medal in 1933 by the Society of Chemical Industry. Before his departure to India, he had completed the manuscript for a new monograph on the same subject.

Dr. Vail studied at the University of Pennsylvania, Harvard University and the Institute of Technology at Darmstadt, Germany. In 1936 he received the honorary D.Sc. degree from Haverford College.

PERMAG
for all Types of
Metal Cleaning

PERMAG Compounds are available for those shops that must deal with a variety of work. The broad and dependable service of PERMAG has built an increasing demand in the plating industry over the years.



Multi-Use
PERMAG Electrolytic Cleaning Compounds
Copy For Your Technical and Purchasing Index File

PURPOSE
a. Use where different kinds of metal are to be treated on the same tank.
b. Used where maximum tolerances are to be established for variations.

REQUIREMENTS
a. Should be easily controlled.
b. Must not attack metals within limits set.
c. Must be stable and effective as used.

CONSIDERATIONS FOR SELECTION
a. Variation limits must be wide.
b. Make-up and maintenance should be simple.
c. Should tolerate heavy soil loads.

Each in this special series on PERMAG Compounds for metal cleaning. Other important items will appear later.

MAGNUSON PRODUCTS CORPORATION
Mfrs. Specialized Cleaning Compounds for Industrial Purposes
50 Court Street - - - - - BROOKLYN 2, N. Y.
In Canada: Canadian PERMAG Products, Ltd. Montreal

always better . . . better all ways . . .

New

COPPER FLAT-TOP

✓ better than ball anodes

● **Flat-Top,** the premium copper anode at a popular price, is SMOOTH! No gates or flash to hang on basket.

● **Flat-Top** has Greater Area. From 20 to 25% more effective area than the ordinary ball. More metal, less frequent loading.

● **Flat-Top** is Pure. No cavities to hide inclusions of copper oxide, silica or dirt. Manufactured from highest purity copper.

✓ better than oval anodes

● **Flat-Top** is "Good to the last molecule!" No waste, no annoying scrapping of "swords" and hooks. 100% efficiency.

● **Flat-Top** is Predictable! Eliminates rapidly changing anode area as ovals corrode, decreasing sludge formation and rough plating.

● **Flat-Top** is Ready! No delay, no extra costs of fabricating and attaching hooks. Load your tanks right from the keg.

✓ and copper Flat-Top is . . .

● **CLEAN!** Packed in new durable wooden kegs, protected from contamination of battered, used drums.

● **CONVENIENT!** Keg is safe to stack, easy to roll or truck. And all these **PREMIUM FEATURES** with substantial savings for you!

Ask for your copy of the Copper Flat-Top Folder. Call the nearest Wagner Branch listed below or write for the name of our representative in your area, if the branch location is not convenient. Wagner Brothers polishing and plating equipment and materials are available in all industrial centers.

Wagner BROTHERS INC.

425 MIDLAND • DETROIT 3, MICH.

WAGNER BROTHERS, INC. BRANCHES

Chicago 30, Illinois
5306 West Lawrence
Spring 7-7795

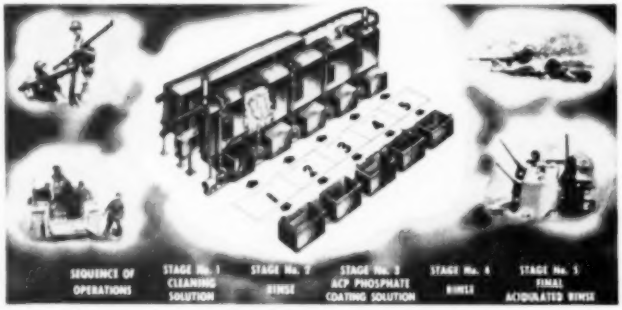
Cincinnati 36, Ohio
6710 Hampton Drive
Sycamore 4911

Rochester 19, New York
322 Genesee Park Blvd.
Genesee 5099

AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet
Subject: METAL PRESERVATION AND PAINT PROTECTION WITH ACP PHOSPHATE COATING CHEMICALS


SEQUENCE OF OPERATIONS
STAGE No. 1 CLEANING SOLUTION
STAGE No. 2 RINSE
STAGE No. 3 ACP PHOSPHATE COATING SOLUTION
STAGE No. 4 RINSE
STAGE No. 5 FINAL ACIDULATED RINSE

U.S. ARMY PHOTOGRAPHS COURTESY OF "ORDNANCE MAGAZINE"

Typical spray and dip phosphating equipment and some ordnance products that are now given a protective phosphate coating for extra durability under all kinds of severe exposure conditions. Both military and civilian applications of ACP phosphate coating chemicals are shown in the chart below.

SELECTION CHART OF ACP PROTECTIVE COATING CHEMICALS FOR STEEL, ZINC, AND ALUMINUM

METAL	ACP CHEMICAL	OBJECT OF COATING	TYPICAL METAL PRODUCTS TREATED	GOVERNMENT SPECIFICATIONS
STEEL	"GRANODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Sheet, coil, or wire fabricated parts or components, automotive bodies, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, rifles, small arms, belt links, cartridge cases, vehicular sheet metal, tank belts and rolls, recoilless guns, etc.	MIL-C-5002 JAN-C-490, Grade 1 JAN-F-495 U.S.A. 57-B-2, Type II, Class C U.S.A. 51-79-1, Finish 22.02, Class C U.S.A. 50-60-1 16 E4 (Ships)
STEEL	"PERMADINE" Zinc Phosphate Coating Chemical	Rust and corrosion prevention	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, helicals, belt links, steel aircraft parts, certain steel projectiles and many other components.	MIL-C-16232 U.S.A. 57-B-2, Type II, Class B U.S.A. 51-79-1, Finish 22.02, Class B Navy Aeronautical M-364 U.S.A. 72-53 (See Air-F-20)
STEEL	"THERMO-GRANODINE" Manganese-type Phosphate Coating	Wear-resistance and galling, lube breakdown of friction or rubbing parts, Rust proofing	Friction surfaces such as pistons, piston rings, gears, cylinder liners, camshafts, tappets, crankshafts, rocker arms, etc. Small arms, weapon components, Hardware items, etc.	MIL-C-16232 U.S.A. 57-B-2, Type II, Class A U.S.A. 51-79-1, Finish 22.02 Class A Navy Aeronautical M-364 U.S.A. 72-53 (See AN-F-20)
STEEL	"GRANODRAW" Zinc-Iron Phosphate Coating	Improved drawing, extrusion, and cold forming	Blanks and sheets for cold forming, heavy stampings, tube, tubing for forming or drawing, wire, rod, etc.	———
ALUMINUM	"ALODINE" Protective Coating	Improved paint adhesion and corrosion resistance	Aluminum products of similar design such as refrigerator parts, wash tubs, sights, washing machine tubs, etc. aircraft and aircraft parts, tachometer, rocket assemblies, helmets, bell bearings, clothes dryers, clothespins, rocket motors, etc. aluminum strip or sheet stock.	MIL-C-5541 (See also QPL-5541-1) MIL-S-5002 AN-F-20 U.S. Navy Dept. O.S. 675 16 E4 (Ships) AN-C-170 (See MIL-C-5541) U.S.A. 72-53 (See AN-F-20)
ZINC	"LITHODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Zinc alloy die castings, zinc or cadmium plated sheet or components, hot dip galvanized stock, galvanneal, signs, siding, roofing, galvanized truck bodies, etc.	QQ-P-416 RR-C-92 JAN-F-495 AN-F-20 U.S.N. Appendix 6 U.S.A. 72-53 (See AN-F-20)

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDERS ON THE ABOVE CHEMICALS AND FOR INFORMATION ON YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES

Trade Literature

L—726. Aircooled Buffs—United Buff Products Corporation, 233 Oak St., Passaic, N. J., offers a 6-page folder describing its Pressure Cooled Airflow buffs and Aircon wheels and their advantages. One table contains recommendations of specific buffs for a wide variety of surfaces, another contains recommended surface speeds. For your copy, use Reader Service Card.

L—727. Automatic Loader, Unloader—Udylite Corporation, Detroit 11, Mich., has issued a catalogue sheet illustrating its automatic loader-unloader, a completely hydraulic unit connecting a parts conveyor with a plating machine. A number of advantages are claimed for this unit, including reduction of manpower requirements, improvement of working conditions, reduction of plating-rack damage. It is adaptable to Udylite Junior and most other Udylite fullautomatics. For your copy, use Reader Service Card.

L—728. Cleaner—A Silicated Metal Cleaner and its uses are outlined in a folder on Metso 66, made by Philadelphia Quartz Company, Public Ledger Bldg., Philadelphia 6, Pa. It covers the properties of this granular material for chemically cleaning metals of grease, oil, buffing or polishing compounds prior to plating or finishing, and includes a chart with directions for concentrations and temperatures in various types of work on steel and nonferrous materials. For your copy, use Reader Service Card.

L—729. Measuring and Production-Line Testing Equipment—An 80-page catalog summarizing for the first time under one cover all of the company's testing and measuring equipment for laboratory and production-line use, has been announced by General Electric Company, Schenectady 5, N. Y.

To be used primarily as a reference, the catalog (GEC-1016) contains more than 150 photographs and diagrams and describes the uses, features, specifications and prices of more than 130 items of G-E testing and measuring equipment, including abrasion tester, anodized-aluminum tester, electron and X-ray diffraction units, spectrophotometer, thickness gages, tachometers, and temperature-measuring equipment. It also contains references to G-E bulletins that describe each device in more detail. For your copy, use Reader Service Card.

L—730. Surface Active Agent for the Elimination of Plating Stains—Haas Miller Corporation, 8th and Bristol Sts., Philadelphia 40, Pa., offers Immunol, a

Silver, gold, and rhodium platers! You can bring some of your plating problems to the surface and put an end to others with "white", plastic TYGON Tank Linings.

Light-reflecting "white" TYGON gives you clear-seeing to the bottom of the tank — tells you when the solution is "dirty" and when to filter — highlights the "work" that drops to the bottom and prevents the contamination that may result.

Besides giving full solution visibility, "white" TYGON linings stop the corrosive attack of any plating solution, cut electrical losses to the minimum, assure freedom from sulfur contamination and prevent "treeing-up" on the tank walls. Tough, resilient, and abrasion-resistant TYGON tank linings are also easy to clean and non-oxidizing for long life. Important, too, is the fact that TYGON is fully approved by leading proprietary plating solution manufacturers.

Why not investigate "white" TYGON Tank Linings, today — we can line practically any tank and are happy to give free estimates. And, while you're about it, check also on black TYGON linings for nickel, copper and chrome plating tanks.

For a prompt answer to your corrosion problems, write, right now! Address: The U. S. Stoneware Co., Process Equipment Division, Akron 9, Ohio.

TYGON
CORROSION-RESISTANT PLASTIC
LININGS

289C

Trade Literature

neutral, nonionic liquid originally developed for use with water as a rust preventive and detergent. Added to the final rinse, it also prevents the rinse water from coalescing to cause stains on plated parts and at the same time protects bright finishes, it is said. Inunimul is not flammable and nontoxic. Bath temperatures may be hot or cold depending on individual cycles. The need for color buffing normally used for stain removal is eliminated. For a brochure describing this and other applications, use Reader Service Card.

L—731. **Electrometric pH Equipment, Spectrophotometers**—Beckman Instruments, Inc., So. Pasadena 72, Calif., has published a 16-page Bulletin No. 300 which describes and illustrates some 20 different instruments and basic accessory units. Sections are devoted to pH meters, glass electrodes and accessory equipment; spectrophotometric equipment that operates in the visible and ultra-violet ranges, including the Flame Attachment units and the Model DUR which permits the continuous automatic analysis of flowing plant streams of gases or liquids; infrared spectrophotometric equipment; the Automatic Titrator; the Micro-Microammeter; radioactivity instruments; and other advanced equipment. For your copy, write direct to the manufacturer and mention PLATING.

L—732. **Metal Cleaning Machine**—The Equipment Division of Magnus Chemical Company, Inc., Garwood, N. J., announces its new Bulletin 703-AL which describes its Aja-Lif parts-cleaning machine for solvent and alkali cleaning of batches of parts. The machine is air powered, no air agitation is used.

A flick of the operating lever brings a platform out of the tank for inspection, loading and unloading of the work. A second flick of the lever lowers the platform to the bottom of the tank where the work is immediately, automatically and vigorously agitated up and down in the solution, removing the dirt.

These cleaning machines are available in three sizes, and can be heated by gas, steam or electricity. For your copy, use Reader Service Card.

L—733. **Barrel Finishing**—Facts that every user needs to know about the Roto-Finish process are said to be contained in a 16-page catalog released by the Roto-Finish Company, 3700 Milham Rd., P. O. Box 988, Kalamazoo, Mich.

The book shows in detail how the process can be used for mechanical deburring, descaling, polishing, brightening and coloring of intricately shaped products. Profusely illustrated, it is divided into five sections; the advantages of the process; the process itself; types of finishes that the process can produce; how to obtain the best results through selection of the right machine and the right chips; typical parts improved by the process. There are also illustrated descriptions of the Roto-Finish line of machines, accessories, and special chips and finishing compounds. The back page shows the Roto-Finish laboratory and offers the services of the company's engineers in solving finishing problems. For your copy, use Reader Service Card.

L—734. **Surface Tension**—Joseph B. Kushner Electroplating School, Stroudsburg 1, Pa., offers any member of the plating industry who writes the school, stating name, company, company position and company address, a free copy of "Practical Surface Tension Secrets for Platers". This 9-page course explains what surface tension is; types of surfactants; the role of surface tension in metal cleaning, in preventing plate roughness and pitting, in affecting dragout and dragin, in waste control, in pickling and in chromic acid-spray control; disadvantages of surfactants; and control of surface tension. Literature references and a list of suppliers are added.

L—735. **Drying Metals by Water Displacement**—A compound known as Water Displacing Liquid No. 51 has been added to the line of water-shedding agents produced by Enthone, Inc., Dept. P, 442 Elm St., New Haven, Conn. The manufacturer claims that this new product offers specific advantages.

The light liquid is said to displace rapidly the water from metal surfaces and to cause it to settle separately to the bottom of the container. Water is forced out of crevices and holes with light agitation of the parts. Tarnishing, staining, and deposition of solid residues are said to be

W•C•M Products of Merit and Dependability

W • C • M BRITE COPPER

A liquid Addition Agent designed to produce a heavy, dense and bright deposit of copper from a cyanide plating bath in a minimum of time at a minimum of cost.

Permits use of mechanical or air agitation — anodes may be bagged without resultant polarization — adaptable to or without the use of current reversal cycles.

W • C • M AFTER ZINC BRITE DIP No.'s 100-300

Constituents of an After Zinc Brite Dip lending maximum brightness and corrosion resistance to a zinc or cadmium deposit.

W•C•M WETTING AGENT 1535

A custom built wetting agent of maximum wetting properties and stability for use in a cyanide copper plating bath.

W • C • M ZINC BRIGHTENER

A solid type brightener and conditioner for addition to a cyanide zinc plating bath. Necessitates minimum make-up and maintenance additions.

W • C • M CADMIUM BRIGHTENER No.'s 1-2

Liquid Addition Agents used in combination to develop a dense, bright deposit from a cadmium plating bath.

W • C • M NO FOAM

A liquid type foam dispersing agent for use in a cyanide zinc plating bath.

W • C • M PAINT BASE A chemical Dip for a zinc or cadmium electro-deposit which permits an effective subsequent application of paint. The Dip in itself will provide an olive drab to golden colored, corrosion resistant surface. Complies with government specifications for this type of finish.

W • C • M AFTER ZINC BRITE DIP NO. 50

Constituent of an After Zinc Brite Dip lending brightness and corrosion resistance to a zinc or cadmium deposit at a low cost. Operation is similar to that of a simple nitric acid dip. May be operated at room temperature and does not require the use of a leach or neutralizer. Adaptable to a manual cycle or that of an automatic machine.

• SEND FOR FULL INFORMATION ON ANY OR ALL PRODUCTS •

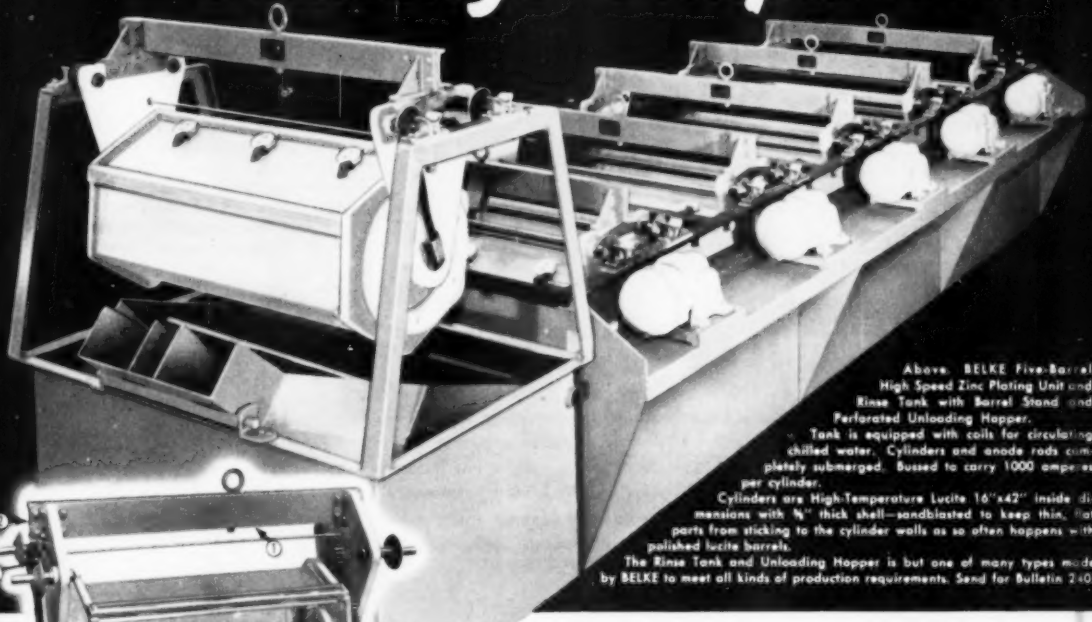
THE WIRE COATING & MANUFACTURING CO.
395 EAST 131st ST. CLEVELAND 8, OHIO

DISTRIBUTORS

Armalite Co., Ltd., Toronto, Canada — General Supply Co., 5317 St. Clair Ave., Cleveland, Ohio — Industrial Chemical & Equip. Co., 705 11th Ave. South, Minneapolis, Minn. — MacDermid Sales & Equip. Corp., Bristol, Conn.

Belke Plating Barrels

Challenge Comparison

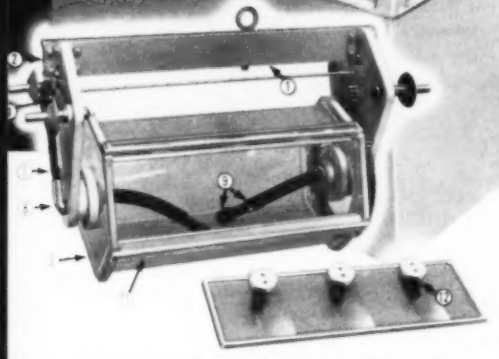


Above. BELKE Five-Barrel High Speed Zinc Plating Unit and Rinse Tank with Barrel Stand and Perforated Unloading Hopper.

Tank is equipped with coils for circulating chilled water. Cylinders and anode rods completely submerged. Bussed to carry 1000 amperes per cylinder.

Cylinders are High-Temperature Lucite 16"x42" inside dimensions with ¾" thick shell—sandblasted to keep thin, flat parts from sticking to the cylinder walls as so often happens with polished lucite barrels.

The Rinse Tank and Unloading Hopper is but one of many types made by BELKE to meet all kinds of production requirements. Send for Bulletin 240.



Features of BELKE Lucite Barrels

Operates through complete electro-cleaning, pickling, acid or alkaline plating and rinsing cycle at temperatures to 180 F.

1. Heavy steel hanger bridge.
2. Rugged, reinforced hanger brackets.
3. Heavy Melamine hangers.
4. Solid copper strap connects contact shafts — all four shafts carry current.
5. Insulated gears.
6. Bushed bearings and sleeved shafts.
7. ¾" diameter copper cathode cable rubber insulated — carries ample current for maximum load without voltage drop.
8. Metal shoe protects cathode cable.
9. Improved flexible cable and 1¾ x 2" ball contacts. Easily replaced.
10. One-piece barrel with extra heavy cement welded end pieces.
11. Heavy door ribs with imbedded stainless steel reinforcement.
12. Positive, quick-acting clamps attached to door. Cannot be misplaced or dropped into solution.

Equip your mechanical plating units with BELKE High-Temperature Lucite Cylinders — regardless of make. Send make and dimensions for quotation or ask your BELKE Service Engineer.

Why BELKE Barrels can't be beat!

Low-loss Current Transmission throughout, from the improved flexible cable and ball contacts to the bus bar, assure ample current capacity with negligible voltage drop for the heaviest plating load the cylinder can hold.

Fast, Easy Loading and Unloading. Large cylinder openings with positive quick-acting clamps attached to the doors. Nothing to misplace or drop into the solution.

Bushed Bearings and Replaceable Shaft Sleeves. You can't prevent wear in plating barrel operation. With BELKE Barrels you simply replace worn sleeves and bushings and save the barrel — keeps barrels operating like new at negligible cost.

Rugged Cylinder Construction. From the hanger bridge throughout, BELKE Cylinders of ALL types are made with oversize members, heavily reinforced and properly insulated. Parts and members are replaceable wherever practical.

Gear-Head Motors, totally enclosed — designed and built for plating barrel service.

Whether you need a midget portable barrel, a replacement cylinder or a complete plating department of any kind, BELKE HAS IT. Ask your BELKE SERVICE ENGINEER or write.

BELKE MANUFACTURING CO.

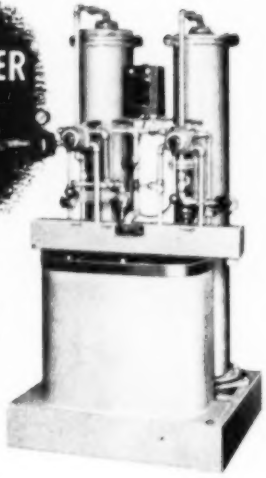
947 N. Cicero Ave., Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

CHEMICALLY PURE WATER *is Cheap*

only a few cents a thousand gallons

with INDUSTRIAL Water Demineralizers



A two-bed INDUSTRIAL demineralizer unit. Standard units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

Eliminate UNWANTED PRECIPITATES HOT WATER RINSE STAINS

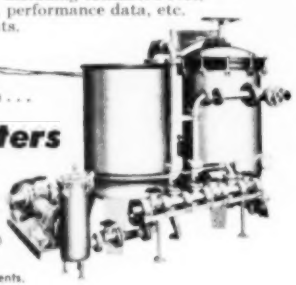
These two difficulties in plating can be eliminated with one stroke—chemically pure water. Pure water in plating solutions improves the over-all quality of plated coatings. The use of pure water for hot rinses prevents stains and water marks after drying. With an INDUSTRIAL demineralizer chemically pure water costs so little that the unit pays for itself in a short time. It's easy to install and operate, and requires very little floor space.

Write for Bulletin 200

or send us a water analysis, letting us know the amount of treated water required in gallons per hour, and whether intermittent or continuous flow is needed. We will then give you the whole demineralizer story, including estimated cost, equipment required, performance data, etc. for your requirements.

for solution clarification . . .

INDUSTRIAL Filters



A typical INDUSTRIAL stationary filter. Standard portable and stationary models are available with capacities 100 to 15,000 gph. Special filtering systems are engineered to meet unusual requirements.

Write for Full Information and Recommendations

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

INDUSTRIAL FILTER & PUMP MFG. CO.

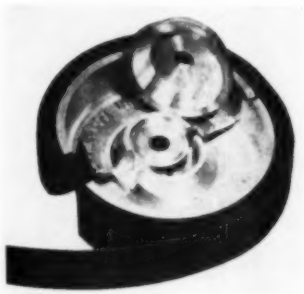
5914 Ogden Avenue
Chicago 50, Illinois

RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

prevented by the thin film remaining after evaporation of the solvent at room temperature. This thin film can be removed conveniently by solvent degreasing if a perfectly clean surface is required, such as for lacquering or enameling. The scarcely detectable liquid film is said to offer moderate protection against rusting or corrosion. Compatible with most rust-proofing and lubricating oils, No. 51 is convenient for drying phosphated coatings, which have a great tendency to retain water. The parts can be transferred without delay to the rustproofing or lubricating oil normally used.

The manufacturer states that the combination of Water Displacing Liquid No. 51 and Enthone's Emulsion Cleaner 75 offers a convenient method of cold cleaning in tool rooms or machine shops to remove oil, dust, chips and other solid dirt. This work is immersed in the cleaner, cold rinsed and immersed in the liquid. For your copy, use Reader Service Card.

L—736. Polishing Wheel with Abrasive Belt—The Carborundum Company, Coated Products Division, Niagara Falls, N. Y., offers a catalogue sheet which describes the Cone-Lee Drum Sander, consisting of a split metal center lined with a rubber or felt cushion and held together with a cone lock. A strip of easily replaced coated abrasive completes the assembly. The units are available in 6.25-, 10-, 12- and 16-inch sizes with rubber cushion, 6.25-inch size with felt cushion, each with a variety of arbor-hole sizes. For your copy, use Reader Service Card.



L—737. Phosphate Coating—Klem Chemicals, Inc., 14401 Lauson Ave., Dearborn, Mich., announces a 4-page bulletin describing its metal-conditioning process, Klem Kote. Used in a 3-stage washer, it is said to give paint adhesion and salt-spray resistance equal to 5- and 6-stage rust-proofing systems. It imparts an iridescent, crystalline, tightly adherent complex phosphate coating to the metal surface. For your copy, use Reader Service Card.

Cowles

SM CLEANER

a non-foaming cleaner

for 1 . . . use as an electrocleaner (cathodically, anodically) on steel when exceptionally high current densities, tank design or type of work tend to produce excessive foaming.

2 . . . use as a detergent in all types of washing machines for die castings, steel, brass and copper.

Because it is formulated with water conditioners, Cowles SM Cleaner is especially effective under hard water conditions.

prompt shipments from convenient warehouse stocks

COWLES TECHNICAL SERVICE
gladly furnished upon request

COWLES CHEMICAL COMPANY
METAL CLEANER DEPARTMENT
7016 EUCLID AVENUE • CLEVELAND 3, OHIO

PLA-TANK®

RESIN-BONDED FIBERGLAS® ELECTROPLATERS' TANKS for HCl, BRIGHT NICKEL, CHROMIUM, LUSTER-ON®, etc.

Now available in many new Standard and Stock sizes for immediate delivery.

NOMINAL SIZES		
Length	**Width**	**Depth**
12	12	12*
156	8	12
16	16	14
30	15	16
20	16	18*
24	18	18*
96	28	20
24	12	24
24	18	24
36	24	24*
40	16	24
48	24	24
53	18	24
24	24	30*
30	30	30*
36	24	30*
48	12	30
60	24	30*
72	24	30*
92	12	30
24	12	36*
24	18	36
24	24	36*
36	24	36*
36	36	36*
48	30	36*
48	48	36
84	48	36
60	12	36
72	36	36*
36	24	42*
84	36	42
48	48	48
144	36	84

ROUND CROCKS	8" I.D. x 6" high	
	18" I.D. x 20" high	
	18" I.D. x 30" high	
	22" I.D. x 32" high	

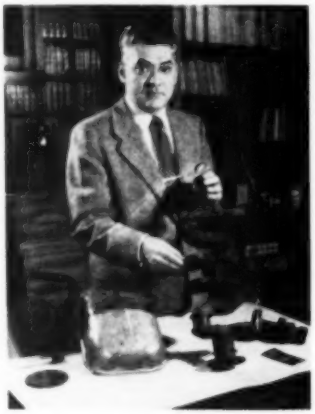
*Regularly carried in stock. Special features, holes, overflow dams, etc., are available. Send specifications.

PRICES AND DATA SHEETS ON REQUEST

THE Chemical CORPORATION
57 Waltham Ave., Springfield 9, Mass.

Equipment and Supplies

E-818. Alkaline Derusting. An alkaline derusting process for steel, cast iron, malleable iron and other iron alloys has been announced by Enthone, Inc., Dept. P, 442 Elm St., New Haven, Conn. No acid being required, subsequent rusting and attack on the base metal are eliminated. High-carbon steels that are prone to be discolored even in inhibited acids can be rapidly derusted without trace of tarnish or attack, it is said.



Dr. Walter R. Meyer, inventor of the process, shown with typical parts that have been derusted.

The solution can be used in a steel tank at room temperature. The work is made the cathode in a solution of Enthone Derusting Compound 134, for from a few seconds to several minutes depending upon the condition of the surface, but in a fraction of the time required for acid pickling. This is important where high-speed pickling of wire or strip must be accomplished. Large objects formerly thought to be unusable because of heavy rust can now be reclaimed. Because the bath is alkaline and contains detergents it also permits simultaneous cleaning and derusting. Zinc can be incorporated to enable cleaning, pickling and zinc plating all in one tank.

Parts heavily contaminated with grease should be first degreased, but light oil is readily removed. A wide range of current density can be employed, from 5 to several hundred asf, speed being dependent upon the current density. The bath is controlled by titration. After derusting, the object is said to be clean and bright. Longer treatment does not result in attack upon the metal, therefore, close watching is not required. Surrounding equipment is not corroded.

NOW! foolproof bond for any product finish

DU-LITE'S PHOSPRAY

a cold spray bonding solution applied with ordinary spray equipment.

Phospray eliminates cleaning, rinsing, drying and other preliminary preparation.

Phospray dries "dust free" immediately, ready for application of final finish.

Phospray can be cut with thinner as high as 3 to 1 without reducing effectiveness.

Phospray has been thoroughly field tested to govt. specs. under conditions of humidity, salt spray, etc.

Phospray cuts processing time, reduces finishing costs, and provides an easy sure-fire bond for organic finishes on almost any metal.

Phospray is made and guaranteed by Du-Lite, the metal finishing specialists.

DU-LITE CHEMICAL CORP.
MIDDLETOWN, CONN.

Send me a sample of Phospray . . ☐
Send more Phospray information . . ☐
Have your representative call. . . . ☐

Name
Company
Address
City Zone State

Du-Lite
METAL FINISHING SPECIALISTS

With these *Laboratory* Developed, Production Proven POLISHING and BUFFING Compounds we can meet your most *difficult* PROBLEM

TRIPOLI COMPOUNDS
For "cutting down" or "coloring" brass, copper, aluminum, zinc die castings.

CHROME COLORING ROUGE
Buffing burned or stained chromium plate. "Coloring" stainless steel.

GREEN ROUGE
To produce an extremely high, mirror-like finish on most metals.

JEWELERS ROUGE
Used for coloring gold, silver, platinum and all precious metals.

CROCUS COMPOUND
Finishing cutlery — Brass — Lead — Tin Plate

STAINLESS STEEL COMPOUNDS
For "cutting down" or "coloring" steel alloys, stainless-chromium steel.

EMERY CAKE
Polishing wheel lubricant and cutting agent. Also "Brush" finishes.

ALUMINUM BUFFING COMPOUNDS
For "cutting down" and "coloring" aluminum stampings or castings.

ALL-PURPOSE BUFFING COMPOUNDS
A general purpose compound for buffing brass — copper — aluminum — zinc — lead and plastic.

WHITE COLORING COMPOUNDS
For producing a high luster on non-ferrous metals.

NICKEL BUFFING (LIME)
For producing a luster on nickel or copper-plated articles.

PLASTIC BUFFING COMPOUNDS
Removing mold flashes or fins, die marks, surface imperfections on Plastics, Celluloid, Bone and Hard Rubber.

TALLOW GREASE STICK
An all-grease lubricant for polishing wheels and band saws.

PUMICE GREASE STICK
For blending or imparting a light "satin" or "brush" finish to all metals.

POLISHING WHEEL CEMENT
A ready-to-use cold glue for bonding abrasive grain to polishing wheels.

PLUS: Many other special formulas developed to meet specific job applications.
Phone, wire or write Now, for Free Samples on any of the products above. Brand new descriptive, technical catalog also available on request.

"Schaffner Bros. make things shine"
Bob — Paul — Gus

Schaffner
MANUFACTURING COMPANY, INC.
SCHAFFNER CENTER • ROSEWOOD 1-9902 • EMSWORTH, PITTSBURGH 2, PA.

* TRIPOLI COMPOUNDS * CHROME COLORING ROUGE * GREEN ROUGE * JEWELERS' ROUGE * CROCUS COMPOUND * STAINLESS STEEL COMPOUNDS * ALUMINUM BUFFING COMPOUNDS * ALL-PURPOSE BUFFING COMPOUNDS * WHITE COLORING COMPOUNDS * NICKEL BUFFING (LIME) * EMERY CAKE * PLASTIC BUFFING COMPOUNDS * TALLOW GREASE STICK * PUMICE GREASE STOCK * POLISHING WHEEL CEMENT * STEEL POLISHING COMPOUNDS

COMPOUNDS MADE IN BAR, SPRAY OR PASTE

PROMAT

A SUCCESSFUL

- ☆ For use over copper, steel or zinc-flashed steel
- ☆ Can be readily chrome-plated — easily color buffed
- ☆ High production, low temperature electrolyte—production is faster
- ☆ Economical—cost comparable to nickel for make-up—lower operating cost
- ☆ Excellent corrosion resistance to red rust when chrome plated or lacquered
- ☆ Suitable for barrel plating and semi- or full-automatic still tanks

PROMAT DIVISION

POOR & COMPANY

851 S. Market Street, Waukegan, Illinois

DISTRIBUTORS

WAGNER BROTHERS, INC.
Detroit, Michigan
Rochester, N. Y.
Don Blum
Cincinnati, Ohio
Bill Young

HAVILAND PRODUCTS CO.
Grand Rapids, Michigan
BART-MESSING
Belleville, New Jersey
REYNOLDS-ROBSON SUPPLY CO.
Philadelphia, Pa.

ARDCO, INC.
Chicago, Illinois
CROWN RHEOSTAT & SUPPLY CO.
Chicago, Illinois
LASALCO, INC.
St. Louis, Missouri

ANNOUNCES

ALTERNATE FOR NICKEL!

HERE'S good news for platers. Many months of research and over five million ampere hours of production have proved conclusively that Promat's new *Probrite White Alloy* is a successful substitute for nickel.

This new process plates readily at high current densities, has high covering power and has acceptable corrosion properties.

Here is a practical answer to plating downtime caused by nickel shortages—a successful solution to production of quality plating on tubular furniture, fastening devices, automotive accessories, appliances and hundreds of other parts.

Complete information, test samples and operating data are available upon request to Promat distributors or Promat Division.

Probrite®

WHITE ALLOY

Mail the Coupon Today

for Complete Data

Promat Division, Poor & Company
851 S. Market St., Waukegan, Ill.

Please send me complete information on Probrite White Alloy.

Name.....

Title.....

Company.....

Street Address.....

City.....Zone.....State.....

Equipment and Supplies

The new process is believed to have particular value to the military as, in emergencies, it can be used at sea or in the field with a portable generator. Tanks can be stainless steel or even wood. For further information, use Reader Service Card.

E-819. Resistance Thermometers—A new line of resistance thermometers designed for accurate indication and control of temperatures from −100 to +300 F has been announced by the General Electric Company's Meter and Instrument Department, Schenectady 5, N. Y.

They are available in three basic types: the HP-11 resistance-thermometer indicator, the HP-13 two-position controller or protector, and the HP-1r three-position controller. Each is designed for either flush or surface mounting. The mechanism is enclosed in a dust-tight case that permits its use in moist or contaminated atmospheres.

Typical examples of equipment with which the thermometers are used include enamel-baking ovens and quenching tanks. For further information, use Reader Service Card.

E-820. Corrosion-Resistant Coating for Degreasers—A tough, nonporous material with superior corrosion-resistance has been developed and is now being used by Detrex Corporation, Detroit 32, Mich., for coating the inside of its line of VS-300 hand-operated solvent-vapor degreasers.

Called Detrex FE-1, this phenolic coating is said to be impervious to any dissolving effect by trichlorethylene and perchlorethylene, resistant to any chemical breakdown caused by water-solvent mixtures and to relatively strong solutions of acids and alkalies and their vapors. Machines coated with FE-1 have been production tested for several years under severe operating conditions without any sign of failure, showing service life comparable with that of machines fabricated from nickel-clad steel.

Should the coating be damaged by physical abuse, it is only necessary to abrade the damaged area with fine steel wool or emery paper, apply Detrex FE-1 by brush, and blend the coating by heating the patch with an alcohol torch. For further information, use Reader Service Card.

E-821. Addition Agent Pump—An addition-agent pump that provides small but constant flow of any addition agent to any reasonably large plating tank is now made available by R. O. Hull & Company, Inc., 1306 Parsons Court, Rocky River 16, Ohio.

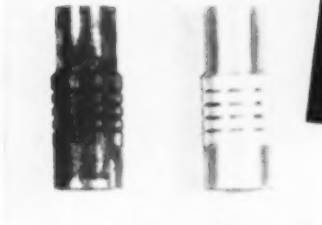
Eliminating the personal element and providing a constant flow rate is said to result in the greatest possible uniformity of plating and the most economical use of addition agents.

The Sigmamotor Proportioning Pump is self-priming. One pump operates 1-4 individual lines from the supply tanks to the plating tanks. Any liquid that does not affect rubber, neoprene or Tygon tubing (liquid does not contact anything but the tubing) can be pumped at any desired rate of flow from 12 ounces to 27 gallons per hour. Addition agents may be diluted as necessary for proper flow rate. The pump can also be used to transfer acids or any other corrosive liquids. For further information, use Reader Service Card.

E-822. Polyethylene Coated Tanks—The Southern Lead Burning Company, 956 Adamson St., S. W., Atlanta, Ga., is now equipped to line with polyethylene all types of tanks and processing equipment, handling of sulfuric, nitric, muriatic, and hydrofluoric acids, as well as a long list of other chemicals. A Linde flame-spraying gun, which produces a high-heat oxy-acetylene flame, is being used for the flame-spraying and also for preheating of the metal. For further information use Reader Service Card.

E-823. Rust Proofing Without Coatings—An economical method of preventing rust and corrosion of metal parts, in the presence of air and moisture, is provided by "VPI" crystals, amine nitrite, made available by the Shell Oil Company, 50 W. 50th St., New York 20, N. Y.

Being slightly volatile at atmospheric temperature, VPI gives off vapors which are carried by convection and diffusion to all surfaces of the metal, where they condense to provide a thin protective layer. The powder-like substance can be applied by placing it in the package enclosing the



Before Pickling

After Pickling

Why Use Hazardous Mineral Acids for Heat Scale and Rust Removal?

Sulfuric or muriatic acids are dangerous to handle and store. They tend to give off fumes which attack nearby metal equipment. There is always the possibility of excessive acid action.

USE *SAFE . . ECONOMICAL . . DEPENDABLE*

MAGNUS D-SCALE-RS

This new crystalline acid material is chemically inert until dissolved in water. It then becomes an effective pickling and derusting acid, applicable to all those operations where sulfuric and muriatic acids are used for the same purposes.

D-Scale-RS can be used in barrel as well as in tank descaling and derusting work. It is safely inhibited to prevent attack on the metals being treated or the equipment in which it is used. There is no danger of overpickling. There are no acid fumes to contend with. It can be used in either hot or cold solution.

WRITE FOR BULLETIN 36
if you are interested in a new standard of safety on your derusting and descaling operations!

MAGNUS CHEMICAL CO. • 41 South Ave., Garwood, N. J.
In Canada — Magnus Chemicals, Ltd., Montreal.
Service representatives in principal cities.

Magnus
CLEANERS • EQUIPMENT • METHODS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 225.

PLATEMANSHIP

H-VW-M's unique combination of:

. . . the most modern and complete laboratory for testing and development

. . . ability to provide complete equipment and materials for every plating and polishing need

. . . the complete background of knowledge and experience in every aspect of plating and polishing

H-VW-M *PLATEMANSHIP* AND THE CADUX HS PROCESS FOR

. . . Maximum versatility with improved covering power produces a highly finished product.

. . . Maximum brightness of deposits enhances appearance, often come mirror-bright from the solution.

. . . Maximum impurity tolerance simplifies control.

. . . Maximum current density range permits faster plating in barrels or on racks. Current densities up to 70 amp. sq. ft. are possible with agitation.

. . . Maximum operating flexibility permits a wide range of solution composition.

With critical materials again in short supply, efficient, precision plating which does not sacrifice quality to economy, is increasingly important. It is for this reason—and for the others mentioned—that the Cadux HS Process is the ideal means of rustproofing iron and steel parts. An exclusive development of H-VW-M and *Platemanship*, it insures faster, brighter cadmium plating.

The Cadux HS Process is typical of the way H-VW-M and *Platemanship* work with the plating and polishing industry . . . to meet and anticipate all needs in all phases of pickling, polishing, buffing, cleaning, anodizing and plating.

For details on the Cadux HS Process, ask for the Technical Instruction Manual.

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, NEW JERSEY

PLANTS AT MATAWAN, N. J. • ANDERSON, INDIANA • SALES OFFICES ANDERSON • BOSTON • CHICAGO CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • MATAWAN • MILWAUKEE • NEW HAVEN NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SPRINGFIELD (MASS.) • STRATFORD (CONN.) • UTICA

H·VW·M

7929

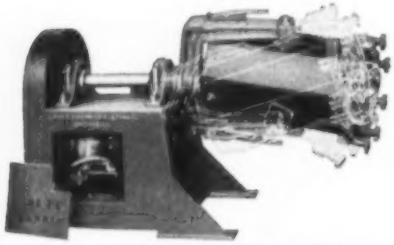
INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

USE "RELIANCE" PRODUCTS FOR

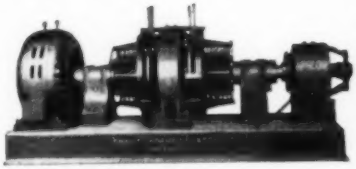
ECONOMY : EFFICIENCY : DEPENDABILITY

LET US SUPPLY YOUR NEEDS FOR YOUR PLATING OR POLISHING DEPARTMENT

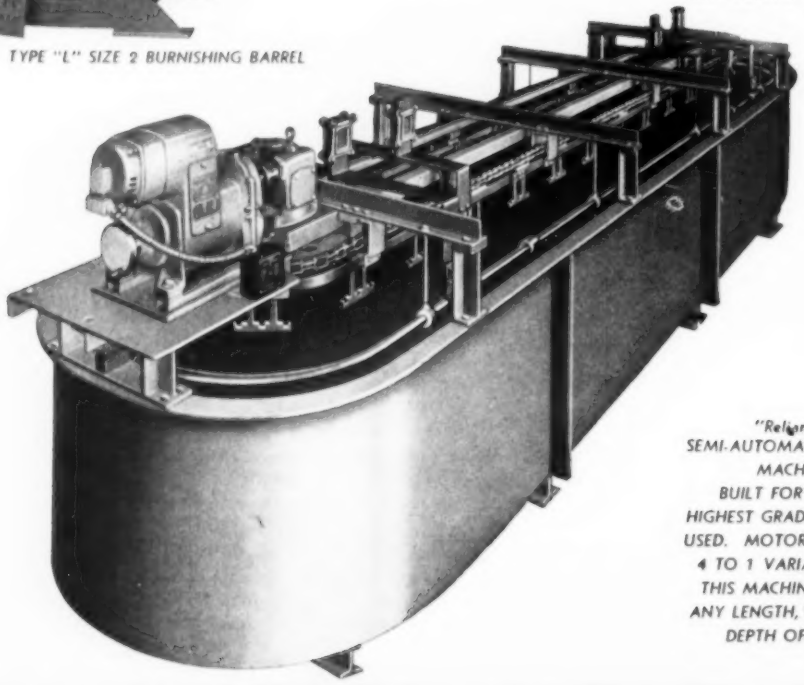
WRITE FOR FURTHER DETAILS



TYPE "L" SIZE 2 BURNISHING BARREL



3000 AMP. 6 VOLT GENERATOR SET



"Reliance"
SEMI-AUTOMATIC PLATING
MACHINE
BUILT FOR SERVICE
HIGHEST GRADE MATERIAL
USED. MOTOR ¾ to 1 HP
4 TO 1 VARIABLE SPEED.
THIS MACHINE IS BUILT
ANY LENGTH, WIDTH AND
DEPTH OF TANK.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS of

Plating and Polishing Machinery

Complete Plating Plants Installed

C. B. Little
Newark, N. J.

W. R. Shields
Detroit, Mich.

O. M. Shoz
Philadelphia, Pa.

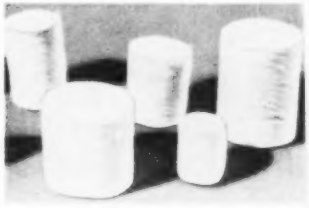
Gen. Office and Factory:
1521 Ogden Ave.
CHICAGO

Branches:
Cleveland
and
Los Angeles

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 227.

parts to be protected (such as ball-bearing races); by blowing it into an area to be protected (as in the aircraft engine); by putting it into a water or alcohol solution (as in the protection of metal parts during and between processing steps such as grinding) and covering the metal parts in tote boxes. An unusual characteristic of VPI is that it will arrest corrosion at any advanced stage. For further information, use Reader Service Card.

E–824. Impregnated Polishing Material—Available in a wide variety of sizes for hand or mechanical use from Embree Manufacturing Company, Elizabeth 4, N. J., Rollies are constructed of cotton



other fibrous materials on request, impregnated throughout with any one of a wide variety of polishing, buffing, oiling or other compounds, then machine rolled in cellulose tissue with both ends exposed for use. They are said to be used in the final buffing and cleaning operations on cast hardware parts and jewelry. For further information, use Reader Service Card.

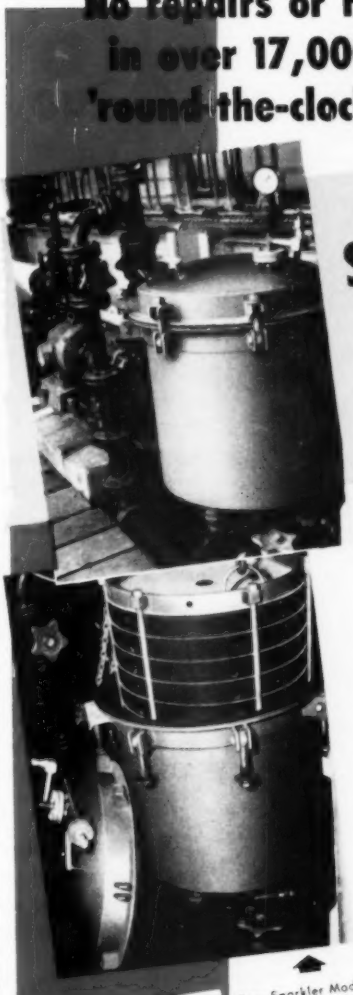
E–825. Polyethylene Funnels and Beakers—American Agile Corporation, Plastics Division, 5806 Hough Ave., Cleveland, Ohio, offers molded polyethylene funnels and beakers for use in many industrial and laboratory applications where corrosive liquids, in particular hydrofluoric acid, are handled. The funnels are available in sizes from 1 to 12 inches in diameter, beakers in 250-ml and 400-ml capacity. For further information, use Reader Service Card.

E–826. Peg Rack Truck—Parts can be moved more carefully from one production operation to another on the Peg Rack Truck designed and built by Lloyd Engineering Co., 59 Stephen Street, Belleville 9, N. J. In transit, the parts hung on cushioning racks inclined at 15° angle are separated from each other as protection against damage.

The trucks are made of heavy steel, all-welded and are furnished with 5- or 6-inch roller-bearing rubber-tired casters. For further information, use Reader Service Card.

No repairs or maintenance in over 17,000 hours of 'round-the-clock operation

. . . yet this SPARKLER *Horizontal Plate* FILTER *is still going strong*



The kind of service Sparkler Horizontal Plate Filters have given the Gillette Safety Razor Company—efficient and trouble-free, even under most extreme conditions—is the kind of service that is vital to *every* filtering operation.

For example: A rubber-lined Sparkler Model 8-18 filter is used by Gillette in the continuous filtration of a 1000-gallon bright nickel plating solution. Now operating for approximately two years, this filter has been on a 24 hours a day, 7 days a week schedule — without any loss of operating time for repairs or maintenance. Also used in periodic batch carbon treatments of nickel solutions this unit, according to Gillette technicians, consistently delivers a brilliantly clear effluent, even though the plates may be packed solid.

Top: Sparkler Model 8-18 filter shown installed in Gillette's plating department. Above: Same filter, with filter plate assembly being removed for cleaning

Left: Sparkler Model 8-6 stainless steel filter. This portable unit is used by Gillette to filter gold plating solutions.

Another Sparkler Filter employed by Gillette is a Model 8-6, stainless steel, portable unit. Used exclusively for cyanide type plating solutions, this Model 8-6 has proved particularly valuable for Gillette's gold plating operations since the patented Sparkler Scavenger Plate assures minimum loss of precious gold solution. Now operating almost six months for at least 2 hours daily, its performance has been satisfactory in every respect.

Our Engineering Department (with more than 25 years' experience in every phase of filtration) is available for consultation without charge.

SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 228.

papa bear...mama bear...baby bear

...and there are all sizes of Green Rectifiers, too... from 150 watts to 150 kilowatts... for all applications where a dependable, more-for-your-money unit is required. Green Rectifiers are best by actual test... and one satisfied user tells (and sells) another.

We have a number of interesting papers on Rectifiers and their applications. Available ... without obligation ... from us or our representatives.

- WALTER R. BINAI, Indianapolis
- CORL CHEMICAL CO., Seattle
- CROWN RHEOSTAT & SUPPLY CO., Chicago
- INDUSTRIAL CHEMICAL & EQUIPT. CO., Minneapolis
- MUNNING & MUNNING, Newark
- WEAVER EQUIPMENT & SUPPLY CO., Houston
- ALLEN I. WILLIAMS, Denver
- W. M. FOTHERINGHAM, Buffalo

W. GREEN ELECTRIC COMPANY, INC.

SELECTRO PLATERS AND ALL TYPES OF RECTIFIER EQUIPMENT

GREEN EXCHANGE BUILDING 120 CEDAR STREET NEW YORK 6, N. Y.

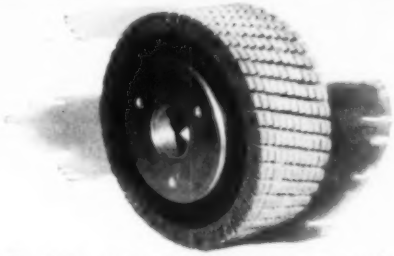
RECTIFIER G ENGINEERS

How would you solve it?

Production problem:

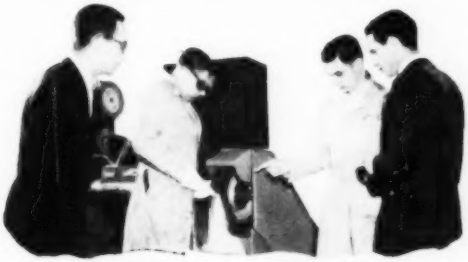
Break a "bottleneck" caused by standard weld-removal methods on cold-rolled steel stator shells

1 Here's what Century Electric Company, Saint Louis, Missouri, did. They turned their weld-removal problem over to a 3M Methods Engineer, who studied the problem with Century Electric specialists and came up with a solution.



2 3M's recommendation was a conversion to backstand equipment with fast-cutting abrasive belts. A specially engineered contact wheel was recommended—plus the right abrasive belt, grit size, and operating speed.

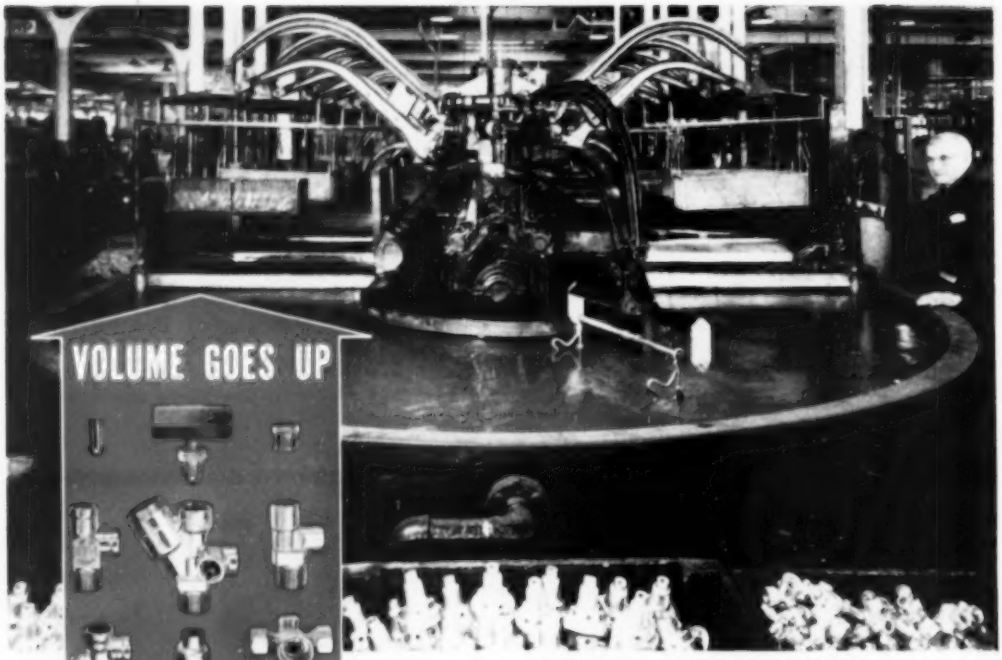
3 Now Century Electric uses the 3M Method to finish stator shells 800% faster than with the previous equipment. Production has jumped from 15 to 125 pieces per hour with smoother finishes too!



4 3M maintains Demonstration Rooms in principal cities throughout the country, where abrasive engineers will demonstrate how you can cut *your* grinding and finishing costs. For additional information on the 3M Method, write for a copy of the "Step UP Production" booklet, Dept. P-22, Minnesota Mining and Manufacturing Co., St. Paul 6, Minnesota.

See 3M Company's TV Program "JUVENILE JURY" on NBC Network

Made in U. S. A. by **MINNESOTA MINING & MFG. CO.**, St. Paul 6, Minn. — also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada.



Stevens Full Automatic at Bastian Blessing's Chicago plant used for processing valve parts shown in inset.

When a Stevens Automatic Goes To Work . . .

Look at the results reported by The Bastian Blessing Company of Chicago, after installing a Stevens Special Full Automatic Bright Dipping Machine!

E. N. Krein, vice president, says: "Although our Stevens Machine has been in operation only three months, it has demonstrated its advantages in so many ways that *we wish to confirm the claims made by Stevens about this equipment!* Parts sent through this machine without prior cleaning come out *dependably and uniformly bright and free from grease, dirt and chips.* We have *increased our volume and reduced our unit costs* on our bright dipping operations. The installation is doing a big job in this day of labor shortages and it is doing it without the fumes and personal protective equipment of the past. Our records show that the workmen appear quite pleased and it looks like we will have less labor turnover in this work."

There you have the word of a satisfied customer—the best endorsement of all. Why don't you let your Stevens representative show you how Stevens equipment can bring new profit and economy to *your* operations? Call him today or write direct to *Frederic B. Stevens, Inc., Detroit 16, Michigan,* for complete information. There's no obligation.

METAL FINISHING EQUIPMENT AND SUPPLIES SINCE 1883

FREDERIC B. BRANCHES • SALES OFFICES Representatives in Principal Cities

STEVENS DETROIT 16, MICHIGAN

INCORPORATED FREDERIC B. STEVENS OF CANADA, LTD. WINDSOR • TORONTO ONTARIO

Staff

Managing Editor
DR. D. G. FOLTZ

Editor
K. G. SODERBERG

Assistant Editor
DR. H. J. READ

Editorial Board
Dr. W. R. Meyer, Dr. E. A. Parker, Dr. R. B. Saltonstall, J. M. Andrus, E. T. Candee, M. B. Diggin, M. Glover, G. W. Jernstedt, L. M. Morse, L. B. Sperry

Advertising
W. C. DIETRICH, *Manager*
LEE F. O'CONNELL, Western Representative (111 N. La Cienega Blvd., Beverly Hills 48, Calif.; 544 Russ Bldg., San Francisco 4, Calif.)

Production Manager
M. K. DICKINSON

Published by the American Electroplaters' Society at 5800 N. Marvine Street, Philadelphia 41, Pa. Editorial, Advertising and Executive Offices: 473 York Road, Jenkintown, Pa. Phone: Ogontz 9650-1. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years; 50c per copy; Foreign, $8.00 per year; $1.00 per copy.

Copyright, 1952, by the American Electroplaters' Society.

PLATING is abstracted regularly in Chemical Abstracts, Engineering Index, Technical Data Digest and Bulletin Analytique.

plating

FEBRUARY, 1952 VOL. 39, NO. 2

Contents

Corrosion Resistance of Copper-Nickel-Chromium Plated Zinc-, Aluminum- and Magnesium-Base Diecastings. 142
M. R. Caldwell, L. B. Sperry, L. M. Morse and H. K. DeLong

Finishing Parker Pens. 149
Thomas H. Laken

Recovery of Chromic Acid from Plating Operations 152
F. R. Keller, C. C. Cupps and R. E. Shaw

Industrial Finishing Exposition. 164

Current and Metal Distribution in Electrodeposition. II. Theoretical Considerations 165
John Kronsbein

Washington Orders 171

Sustaining Membership List 202

Monthly Features

Industry News 111
Personals 116
Trade Literature 122
Equipment and Supplies 128
Editorial 141
Book Review 163
Question Box 172
Article Abstracts 174
Patent Abstracts 178
A. E. S. News 186
Branch News 186
Membership Report 201
A. E. S. Directory 204
Advertising Index 205
Future Meetings 206

Harshaw

FLUOBORATE PLATING CHEMICALS

CADMIUM FLUOBORATE

• Lead Fluoborate •

• Copper Fluoborate • Tin Fluoborate •

• Fluoboric Acid •

in CLEVELAND • 1945 E. 97th St.

in CINCINNATI • 611 American Bldg.

in CHICAGO • 505 North La Salle St.

in DETROIT • 9240 Hubbell Ave.

in HOUSTON • 6622 Supply Row

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

in LOS ANGELES • 3237 South Garfield Ave.

in NEW YORK • 420 Lexington Ave.

in PHILADELPHIA • Jackson and Swanson Sts.

in PITTSBURGH • 7th and Carson Sts.

Select the nearest Harshaw Branch

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 231.

Editorial

More Metals

CHARLES E. WILSON'S fourth quarterly report to the President, "The Battle for Production", contains much interesting information about what is being done to increase the military and economic strength of the United States and its allies.

Of special interest to platers are the attempts to raise the domestic production of nonferrous metals. Projects for mine, smelter and refinery production of zinc are expected to yield an additional 50,000 tons of zinc in 1952 and a further increase of 150,000 tons in 1953. That means a production in 1953 of 20 per cent above that in 1951. An increase in zinc production in French Morocco is in prospect and should serve to meet French needs and allow some export.

Government aid to the domestic high-cost-copper producers is expected to bring results in 1953 and 1954, and expansion projects in Chile, Peru and Rhodesia will add to the world supply in 1952. (According to Anaconda Copper Mining Company, two new Anaconda projects, one in the U. S. and one in Chile, will begin operations in the Spring of 1952 and produce 95,000 tons in 1953. The company estimates that beginning 1954, copper production in the U. S. and friendly countries will be about 205,000 tons per year above present production. The 1951 copper production has been estimated at 933,000 tons.)

Additional nickel is being developed in Canada and New Caledonia. The Nicaro project in Cuba will be back in production early in 1952 and is expected to add 15 per cent to our total nickel supplies in 1953.

Numerous small deposits of high-grade chromium ore are now being mined in Oregon. More important, transportation improvements will result in increased shipments of chromium ore from Southern Rhodesia late in 1952. Development of deposits in Turkey is also promising.

To overcome the competition for materials between the Western nations, an attempt is now being made to allocate supplies. To date, the International Materials Conference has made recommendations on copper, nickel, zinc and five other materials.

With increasing defense requirements, there is little hope for any easing of the strain during 1952. What happens after that unquestionably depends on how the international situation develops.

Gustaf Soderberg

Corrosion Resistance of Copper-Nickel-Chromium Plated Zinc-, Aluminum- and Magnesium-Base Diecastings

M. R. CALDWELL*, L. B. SPERRY*, L. M. MORSE† AND H. K. DELONG‡

Introduction

In April, 1949, it occurred to the authors and the late Carl E. Heussner that research work should be carried out in order that we be able to write specifications for the plating of aluminum and magnesium diecastings. We were aware of the remarkable work done by Fred Keller, of the Aluminum Company of America, and others, which has greatly advanced the progress in the industry towards obtaining a satisfactory finish on aluminum and magnesium diecastings. Individual reports on any one metal, however, no matter how thorough, do not provide the information needed in order to write a specification. For that purpose, we wanted to know the comparative protection offered by various thicknesses of copper and nickel on zinc, aluminum and magnesium alloys. A plan was therefore adopted for a combined research program.

Objectives

The specific objectives of this project were to determine how chromium plated zinc-, aluminum-, and magnesium-alloy diecastings compare as to rate and type of corrosion when exposed to different outside atmospheres; how much plate is required to furnish adequate protection for each; how different alloys of aluminum compare with each other, and how Watts nickel compares with a bright nickel under these conditions.

Tests

To accomplish this, it was decided to plate 20 lots of 36 test panels each, to be used as follows:

5 — Salt spray test
5 — Exposure test at Detroit (roof of a building at Chrysler Engineering)
5 — Exposure test at Coraopolis, Pa., near Pittsburgh (yard of Standard Steel Spring Company's Plant No. 3)
5 — Exposure test at Miami Beach (roof of a building at the beach about 100 yd from the ocean)
5 — Exposure test on a farm near Grand Rapids
11 — Extras, for adhesion and thickness tests and any advisable substitutions

36 — Total No. of plates per lot
20 — Lots = a total of 720 pieces

The base metals used in this project and their nominal composition are listed in Table I.

Panel Preparation

The zinc-alloy test panels were cast and plated by Doehler-Jarvis Corporation; the aluminum-alloy test panels were cast by Doehler-Jarvis Corporation and plated by Central Engineering Division, Chrysler Corporation; the magnesium-alloy panels were cast by Dow Chemical Company and plated by Central Engineering Division, Chrysler Corporation.

Fig. 1 shows the Chrysler plating laboratory, where the aluminum- and magnesium-alloy panels were plated, and the Doehler-Jarvis plating laboratory, where the zinc-alloy panels were plated.

The test panels were plated on special racks holding 6 panels each. Anodes in the tanks were specially cut and arranged. By these means, it was possible to obtain a uniform plate thickness, varying not more than ± 10 per cent at any point $\frac{1}{4}$ inch (6 mm) away from any edge. Nickel thickness was checked by Magne-gage on one plate from each rack. Copper and nickel thicknesses were checked microscopically, and chromium thickness by the drop test, on two plates from each lot. Adhesion was also tested on the same panels by physical deformation (hammering, bending, breaking).

All panels were buffed and color buffed before plating. The zinc-alloy panels were plated by the usual method: anodic hot-alkaline clean, rinse, acid dip, rinse, plate. The duPont Hi-Speed copper bath was used for copper plating following a copper strike.

*Doehler-Jarvis Corporation. †Central Engineering Division, Chrysler Corporation. ‡Dow Chemical Company.

TABLE I. NOMINAL COMPOSITION OF BASE METAL ALLOYS

Type	Designation	Composition, %
Zinc-base	Zamak No. 3	3.5–4.3 Al, 0.10 Cu, 0.03–0.08 Mg, bal. Zn
Magnesium-base	Dowmetal R	9.0 Al, 0.2 Mn, 0.6 Zn, bal. Mg.
Aluminum-base	Alcoa No. 85	3.0–4.0 Cu, 4.5–5.5 Si, bal. Al
	Alcoa No. 380	3.0–4.0 Cu, 7.5–9.5 Si, bal. Al
	Alcoa No. 218	7.5–8.5 Mg, bal. Al

The aluminum-alloy panels were polished and buffed, and then vapor degreased before alkaline soak cleaning and acid dipping. After a zinc immersion treatment and rinsing, the acid dip was repeated to remove the zinc, and zinc was again deposited on the panels by immersion. The copper strike was the usual low-*p*H, low-free-cyanide strike used for aluminum. The duPont Hi-Speed Copper bath was used for copper plating.

The magnesium-alloy panels were first pickled for 1 minute in a 90 per cent by volume solution of 85 per cent phosphoric acid at room temperature. After rinsing and drying, they were polished and buffed, degreased, hot-alkaline soak cleaned, and then cleaned cathodically in the same solution for 0.5–1 minute. From here on, the process was as described in the Dow Chemical Company Bulletin No. DM 108a, "Electroplating Magnesium and Its Alloys". Copper plating was done in the duPont Hi-Speed Copper solution.

A good bright nickel was used for the standard nickel plate, the bath being adequately maintained to produce bright and ductile nickel. It should be borne in mind that the nickel plate on all the aluminum- and magnesium-alloy panels and the Watts-type nickel plate on the zinc-alloy panels were buffed to obtain the necessary luster. On none of the other zinc-alloy panels was the nickel plate buffed. It is known, from previous exposure tests, that buffing of the nickel plate with lime composition results in a much more rapid and severe staining of the plate in industrial atmospheres, but apparently it closes some pores, resulting in less corrosion of the base metal and less blistering, especially in a marine atmosphere. One lot of aluminum panels (2DA) and one lot of magnesium panels (3DM) were prepared without buffing of the nickel in order to observe the effects of nickel buffing on these metals.

The sulfate-type chromium plating bath, with a 100-to-1 ratio, was used for chromium plating. The chromium plate was 0.00001 inch (0.25μ) thick.

All plates on exposure were held by porcelain insulators at an angle of 30° or 45° from the horizontal, facing south. Figs. 2 and 3 show test plates on exposure at Detroit, Pittsburgh, Miami Beach, and Grand Rapids.

Two of the five panels of some of the lots of aluminum- and magnesium-alloy panels exposed at Detroit were deeply scored across the face with an X in order to permit observation of the effects of deep scratches.

Rating System

The rating system used had been devised by the Doehler-Jarvis and Chrysler Laboratories during a previous program of exposure tests. The Committee B-8, A. S. T. M., method of rating[1] had been used at first. For our use, this system had two faults: (1) the numerical rating takes into account only the percentage of area showing defects and not the seriousness of

Fig. 1. Views from the plating laboratories of the Central Engineering Division, Chrysler Corporation (top) and the Doehler-Jarvis Corporation (bottom)

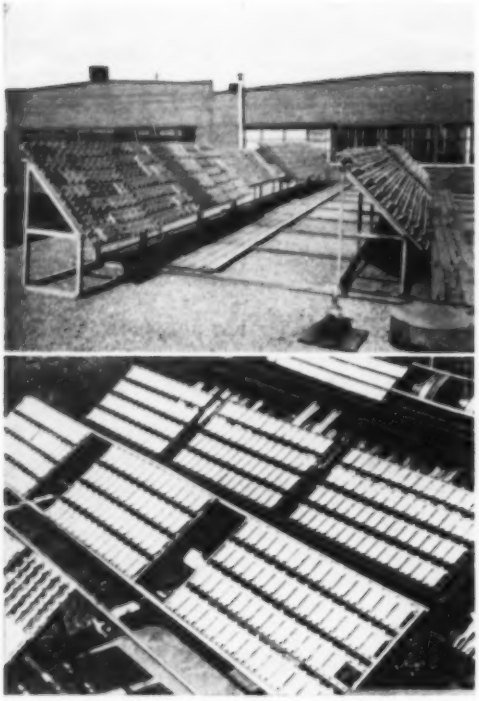


Fig. 2. Exposure sites at Detroit (top) and Pittsburgh (bottom)

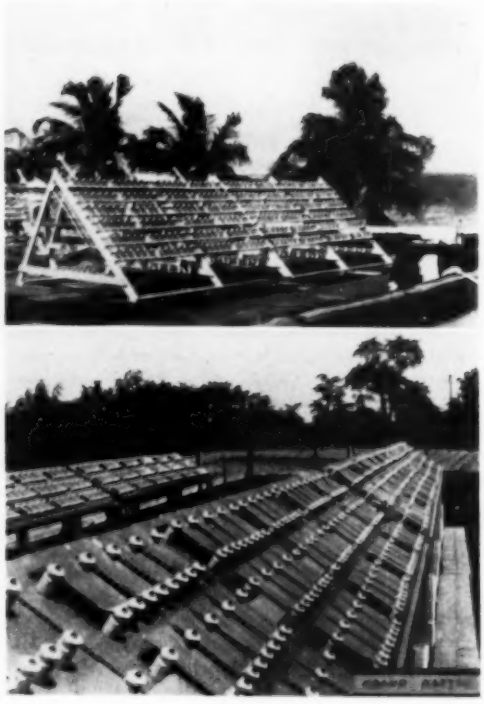


Fig. 3. Exposure sites at Miami Beach (top) and Grand Rapids (bottom)

the defect; e. g., blisters are much more serious than surface stains; and (2) with the system of shorthand notations used, any averaging is impossible, and the data are so voluminous that they are very cumbersome.

The present system of rating was evolved gradually and has proven quite satisfactory to us. Three main plate defects were recognized: (1) corrosion or staining of the plate itself, (2) corrosion of the base metal, and (3) blistering of the plate. Corrosion of the plate was considered the least serious, corrosion of the base metal twice as serious, and blistering four times as serious. The corrosion products of any of the three base metals involved are white or light grey, whereas the nickel and copper corrosion products are dark

TABLE II. COMMITTEE B-8, A. S. T. M. SYSTEM OF NUMERICAL RATING

Rating	% Area Defective
10	0
9	0+ to 0.1
8	0.1+ to 0.25
7	0.25+ to 0.5
6	0.5+ to 1.0
5	1.0+ to 2.5
4	2.5+ to 5
3	5+ to 10
2	10+ to 25
1	25+ to 50
0	50+ to 100

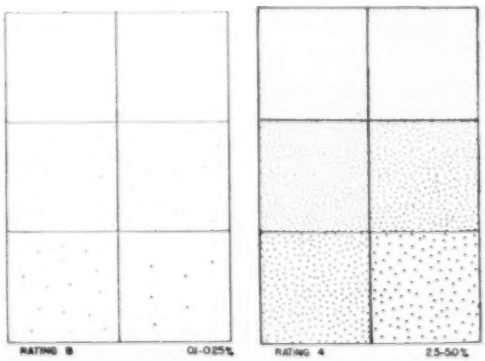


Fig. 4. Rating charts Nos. 8 and 4. (0.4X)

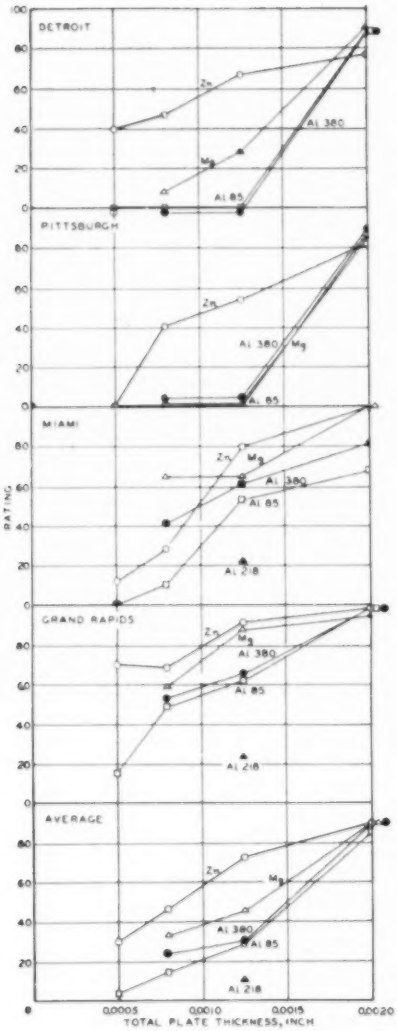


Fig. 5. Effect of plate thickness on rating after 12 months of exposure of zinc alloy Zamak 3 (Zn), magnesium alloy Dowmetal B (Mg), and aluminum alloys Alcoa Nos. 380 (Al 380), 85 (Al 85) and 280 (Al 280)

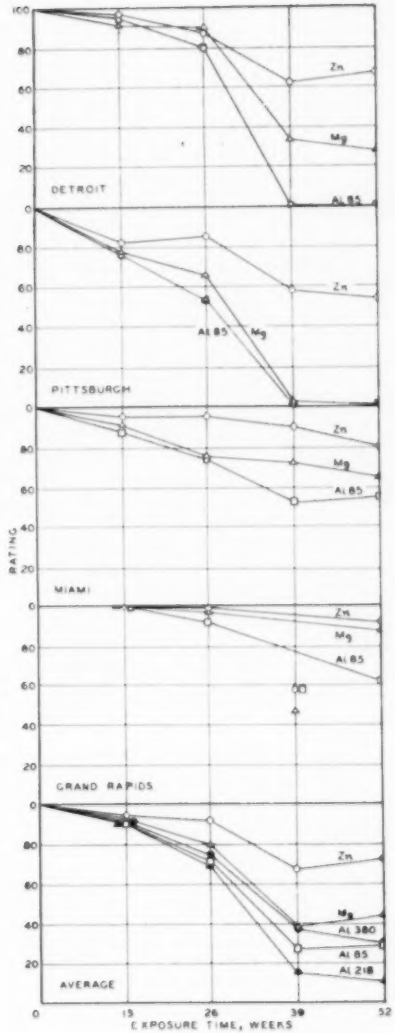


Fig. 6. Effect of time of exposure on rating of panels of zinc alloy Zamak 3 (Zn), magnesium alloy Dowmetal B (Mg) and aluminum alloys Alcoa Nos. 380 (Al 380), 85 (Al 85) and 280 (Al 280) with 0.00125 inch total plate thickness

brown or black. It is sometimes difficult, therefore, to determine the amount of base-metal corrosion products present; they may be masked by the dark corrosion products of the plate. This is particularly true at Pittsburgh.

Staining and corrosion of the plate were evaluated by an "S" rating, using the 10-to-0 range and percentage-area system of Committee B-8, A. S. T. M. (Table II). Rating was greatly facilitated by charts (also used on the aforementioned previous project), there being one chart for each rating from 9 to 1 inclusive (Fig. 4). Corrosion of the base metal was evaluated by an "R" rating in like manner. Blistering was evaluated by a "B" rating, also in the same manner. From these three ratings, a "T", or total, rating was calculated by means of following formula:

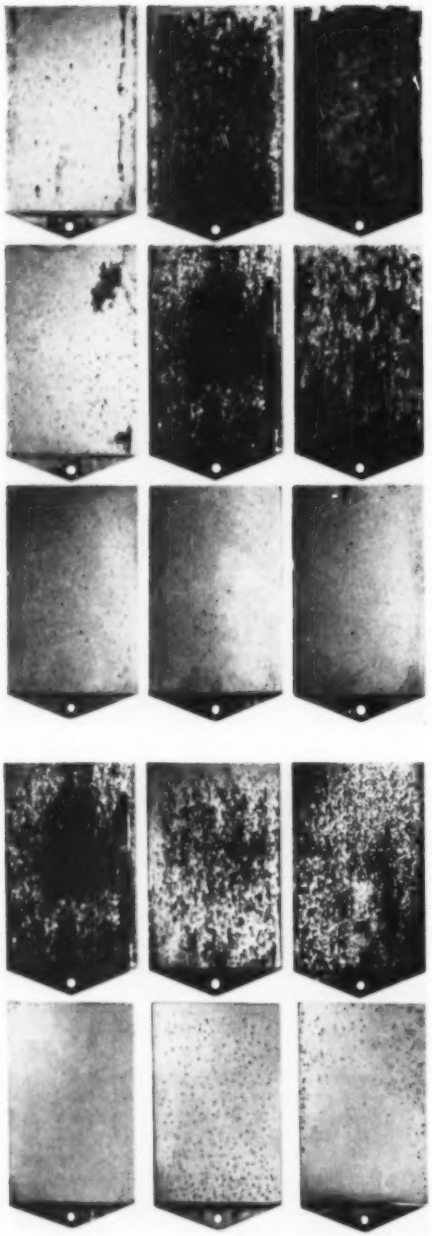


Fig. 7b. Panels with 0.00125 inch total plate thickness after exposure at Pittsburgh. From left to right: top row, aluminum alloys Alcoa Nos. 85, 380 and 218 exposed for 9 months; bottom row, zinc alloy Zamak 3, aluminum alloy Alcoa No. 380, magnesium alloy Dowmetal R after 12 months of exposure and cleaning

← *Fig. 7a. Plated panels after 9 months of exposure at Pittsburgh. From left to right: zinc alloy Zamak 3, aluminum alloy Alcoa No. 85, magnesium alloy Dowmetal R. Total plate thickness: top row, 0.0008 inch; middle row, 0.00125 inch; bottom row, 0.002 inch*

$$T = 10\,(10 - [(10 - B) + \tfrac{1}{2}(10 - R) + \tfrac{1}{4}(10 - S)])$$

Inspection will reveal the simplicity of this complicated-appearing formula, and enable one to see how the importance of the defect affects the "T" rating. The multiplication by 10 puts the final rating on a 100-for-perfect basis, eliminating decimals. Although it is theoretically possible to get a "T" rating of −75 by this formula, any test is finished by the time a 0 rating has been reached, and there is nothing to be gained by carrying it beyond this point.

Some complications were encountered after the test panels had been on exposure sufficiently long for heavy corrosion products to accumulate on the surface. Certain panels which looked bad before cleaning looked much better, in comparison to others, after cleaning. Consequently, after the 12 months' inspection, the panels in all locations except the rural (Grand Rapids) were cleaned and reinspected. Inasmuch as these ratings of cleaned panels were considered more representative of the value of the plate, they were used in preparation of the 12-month-exposure graphs.

The regular inspections and ratings made at Miami Beach were by the South Florida Test Service, which used the A. S. T. M. system. "T" ratings were obtained from these simply by multiplying by 10. Practically no staining occurred at Miami, and base-metal corrosion soon developed into blisters, so that the errors introduced were small.

Inspections and ratings of the panels were made after 9, 13, 26, 39, and 52 weeks. The 9-week ratings were not particularly significant, and are ignored in this report. It will be noticed that some of the 52-week ratings are higher than the corresponding 39-week ratings. This is particularly true for the test plates exposed in Grand Rapids. It is not due to inconsistent or poor rating but to the fact that some superficial or nonadherent corrosion products formed during the winter were subsequently washed off by spring rains.

The test plates were all placed on exposure about June 1, 1950. In the northern climate, corrosion is more rapid in the winter months, whereas at Miami corrosion is reported slightly more rapid in the summer months. It is well to bear this in mind when considering the graphs for rates of corrosion.

All panels having 0.002 inch (51μ) of plate are being exposed further, after one year of test.

Results

The results of the outdoor-exposure tests, as well as

Fig. 8a. Plated panels after 12 months of exposure at Miami Beach. Top and middle row, from left to right: zinc alloy Zamak 3, aluminum alloy Alcoa No. 85, magnesium alloy Dowmetal R. Bottom row, from left to right: aluminum alloys Alcoa Nos. 85, 380 and 218. Total plate thickness: top and bottom rows, 0.00125 inch; middle row, 0.002 inch

of the salt-spray tests are collected in Table III and in the figures which follow.

Discussion of Results

The following were major factors affecting the rate of corrosion:

1. Base-metal chemical composition
2. Thickness of plate
3. Atmosphere

These factors must be considered in relation to each other.

Fig. 5 shows the ratings after 12 months for all locations, plotted against the total plate thickness. It is clearly indicated that, on the average, at least for plate thickness of less than 0.002 inch (51μ), the zinc-alloy is the best as a base for copper-nickel-chromium plate. The magnesium-alloy is second, with aluminum-alloy Alcoa No. 380 third. Aluminum-alloy Alcoa No. 85 is a close fourth, and Alcoa No. 218 is the poorest.

Fig. 6 shows the progress of corrosion at Detroit, Pittsburgh, Miami, and Grand Rapids, respectively, with 0.00125 inch (32μ) of plate. In each location, the different base metals rate in the same order as above.

Fig. 7a shows zinc-, aluminum- and magnesium-alloy panels after 9 months of exposure in the heavy industrial atmosphere of Pittsburgh. The top row has 0.0008 (20μ), the middle 0.00125 (32μ), and the bottom 0.002 inch (51μ) total plate thickness. The increase from 0.0008 inch to 0.00125 inch has given very little improvement. With the increase to 0.002 inch, the zinc panel shows some improvement, but the improvement in the aluminum- and magnesium-alloy panels is large and striking.

Fig. 7b, bottom row, shows the same panels as in 7a, middle row, after 12 months of exposure and subsequent cleaning. The rating of the aluminum- and magnesium-alloy panels was much improved by the cleaning.

Fig. 7b, top row, shows corresponding aluminum panels of different alloys: Alcoa Nos. 85, 380, and 218. It will be noted that No. 380 (center) is not quite as corroded as No. 85 (left), and that on No. 218 (right) corrosion has destroyed the adhesion of about half of the plate. This is typical of this aluminum alloy (9 per cent magnesium, balance aluminum), and accounts for its being the poorest of the alloys tested. The loss of adhesion also eventually occurs with the other aluminum alloys. It occurs most rapidly in the Miami atmosphere, as shown by Fig. 8a, bottom row.

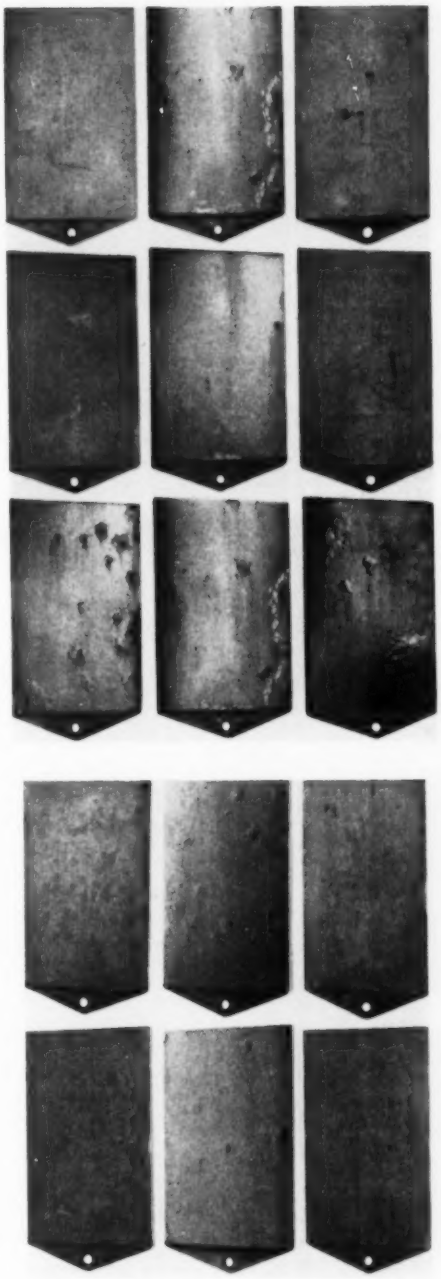
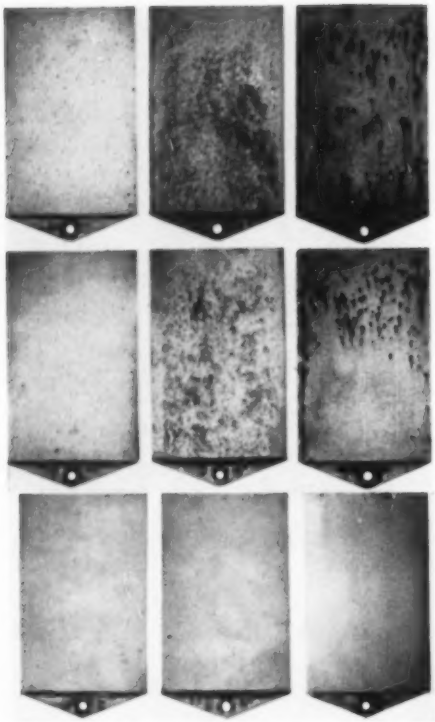


Fig. 8b. Plated panels after 6 months of exposure at Miami Beach. From left to right: zinc alloy Zamak 3, aluminum alloy Alcoa No. 85, magnesium alloy Dowmetal R. Total plate thickness: top row, 0.0008 inch; middle row, 0.00125 inch



← *Fig. 9a. Plated panels after 9 months of exposure at Detroit. From left to right: zinc alloy Zamak 3, aluminum alloy Alcoa No. 85, magnesium alloy Dowmetal R. Total plate thickness: top row, 0.0008 inch; middle row, 0.00125 inch; bottom row, 0.002 inch*

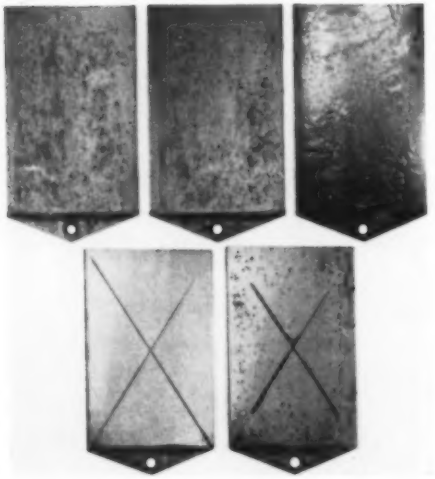


Fig. 9b. Panels with 0.00125 inch total plate thickness after exposure at Detroit. From left to right: top row, aluminum alloys Alcoa Nos. 85, 380 and 218 after 9 months of exposure; bottom row, aluminum Alloy Alcoa No. 380 and magnesium alloy Dowmetal R after 12 months of exposure and cleaning

It is believed that the characteristic spreading of corrosion under the plate observed on the aluminum panels is due to the intermediate layer of zinc, which is reported to be anodic to aluminum and certainly is anodic to nickel and chromium. Thus, electrolyte films may penetrate any pores in the decorative plate and corrode the zinc out from beneath the plate. Methods are known for plating aluminum without the use of zinc films, and exposure tests on panels plated by some of these methods indicate that this type of failure is not always encountered on plated aluminum.

Magnesium also fails in a typical manner in the Miami atmosphere, as shown by the right-hand panel, top row, of Fig. 8a. The three large spots are crater-like eruptions of corrosion products. The base metal is corroded away, leaving large, deep holes.

The zinc panel, to the left in the same row, shows some abrasion, suffered when a hurricane struck with very little warning, so that time was not sufficient to get all of the panels indoors.

Fig. 8b, top row, shows zinc-, aluminum-, and magnesium-alloy panels having 0.0008 inch (20 μ) of total plate after 6 months of exposure at Miami. The aluminum-alloy panel (center) again shows typical loss of adhesion due to corrosion, which started at a pore and crept rapidly along the interface. The magnesium panel shows the typical crater-like eruptions starting from pores. Like panels, but with 0.00125 inch (32 μ) of plate, are found in the bottom row. The black spots on the zinc-alloy panel are asphalt roofing cement, which adhered when the panel was blown off onto the roof during a hurricane. Fig. 8a, middle row, shows like panels but with 0.002 inch (0.51 μ) of plate after 12 months of exposure.

Fig. 9a shows zinc-, aluminum-, and magnesium-alloy panels after 9 months of exposure at Detroit. Note that there is a sharp improvement in the zinc-alloy panels, left, as the total plate thickness is increased from 0.0008 inch (20 μ) (top row) to 0.00125 inch (32 μ) (middle row). With 0.002 inch (51 μ) of plate (bottom row) there is no further improvement in the zinc-alloy panel, but a tremendous improvement in the aluminum- and magnesium-alloy panels.

Fig. 9b, top row, shows panels of aluminum alloys: Alcoa Nos. 85, 380, and 218 with 0.00125 inch (32 μ) of total plate, after 9 months of exposure at Detroit. No. 380 is definitely better than No. 85. No. 218 has lost adhesion of the plate over large areas.

Fig. 9b, bottom row, shows panels of aluminum- and magnesium-alloy which had been deeply scribed be-

(Continued on page 158)

(Left) **Automatic four-head** plastic-pen-barrel buffing machine with oscillating liquid spray applicators. Wheel pressures are electrically indicated by means of ammeters and mechanically adjusted. Hopper-fed parts are dual hand loaded, rotated past the buffing wheels, automatically ejected through hollow arbors and conveyed to further processing. (Right) **Deburring and buffing** of gold-pen-point slits on a small horizontal rotary machine. The final wheel ejects the parts from the arbor into a combination hood and chute.

FINISHING PARKER PENS

THOMAS H. LAKEN, *Finishing Engineer, The Parker Pen Company*

EVER SINCE GEORGE S. PARKER decided back in 1888 that he could make a better fountain pen, progress in finishing and plating techniques necessary to maintain the company's position as a leader in the industry has been continuous.

To satisfy the public demand for Parker products, modern manufacturing methods are, of course, essential. To guarantee product uniformity and simplify operator training and supervision, automatic or semiautomatic operations have been installed throughout, some of them of Parker design and manufacture.

Unusual applications of standard and special equipment can be found in the various manufacturing departments for finishing plastic and metal parts of the different pen and pencil models. For example, to finish *pen barrels* uniformly, the horizontal-arbor 4-head rotary machine shown here was developed by Parker engineers with the cooperation of the Acme Manufacturing Company. Buffing-compound application to the 12-inch wide wheels was clearly suited for the use of liquid compounds. It was not practical to use on this automatic machine the pumice compounds that had been developed for hand operations. Instead a dry-type air-float Tripoli compound was found to be the most satisfactory. Oscillating guns made by the J. J. Siefen Company are used for the application of the compound. Now bar pumice compounds used on plastic parts are being replaced by liquid compounds containing the various types of Tripoli.

Ventilated buffs of 86 x 93 thread count (per inch) are used in making the three cut-down wheels, and individually spaced canton-flannel sections make up the coloring wheel. The 16-inch (41-cm) diameter wheels run at a surface speed of 3600 ft/min (1100 m/min).

The slits in the "51" pen's gold tubular *nib*, or point, and in the "21" pen's Octanium nib requires different deburring methods because of different material characteristics. The "51" nib is deburred on a small horizontal rotary buffing machine, and the "21" nib slit is deburred in Almco deburring barrels. Here, special-size neoprene-lined compartments are used to handle lots of 2,000 parts in each section. Super-Honite chips have been found satisfactory for deburring at a speed of 45 rpm for the cutting operation and 25 rpm for finish grind. Automatic timers release operators for other work and allow the units to be run after working hours when extended time cycles are employed.

Clips fabricated from rolled-gold stock must be color gold plated to match the underside with the face. This is done in a submerged Lucite barrel in a solution containing 0.8 g/l gold, 8.5 g/l free cyanide, 1.7 g/l nickel operated at 110° F (43° C) at *p*H 11.0. Additions to the solution are made by the operator based on the quantity of work entering the bath.

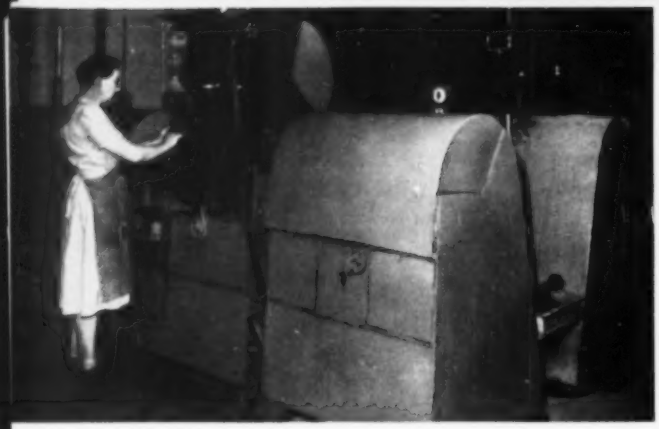
It may be of interest to note that some racked parts are white-gold plated in the same bath by only changing the current.

Stainless-steel *caps* are ground on Porter-Cable vertical grinders to which have been added solenoid-actuated belt-tensioning devices and liquid grease spray applicators. Rough grinding is done on 220 E paper belts, finish grinding on 320 E belts. The Behr-Manning Company has conducted considerable research which enables it to provide paper that will stand up in contour grinding, track to a straight line in operations making use of masks, and withstand the 8–10 per cent moisture content of the liquid belt grease. The back-up contact wheel which has a contoured neoprene face of 30 durometer hardness is carefully balanced. All types of fabric belts have proven unsatisfactory for grinding to a masked stop-off.

The Acme L-8 indexing hands used as a part of the steel-cap finishing equipment have been fitted with expanding arbors to facilitate loading and unloading.

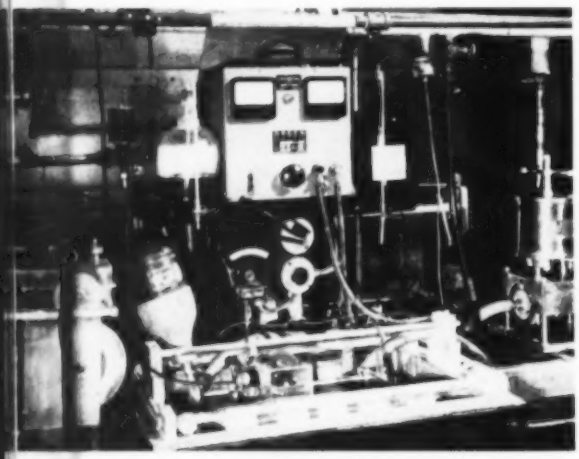
Specially designed rotary finishing equipment also using a central recirculating-liquid-compound supply system is used for the various cut-down and color-buffing operations performed on all styles of pen and pencil caps.

Because of the quality of finishes produced, all external parts are stored and transported in specially designed *tote boxes* which prevent marring and abrading of surfaces during the manufacturing and assembly processes.



One of several groups of double barrel deburring and burnishing units. Each barrel is divided into two sections to facilitate the processing of diversified lots of material at the same time.

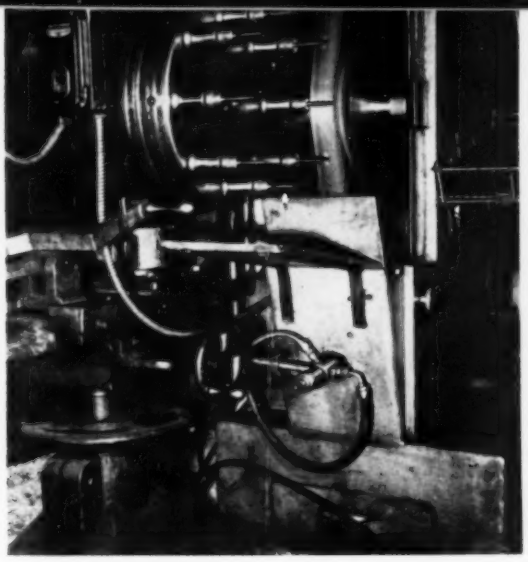
Barrel gold plating operation. Three stainless-steel dragout tanks are shown in the foreground. All plating and dragout solutions are filtered regularly through carbon.

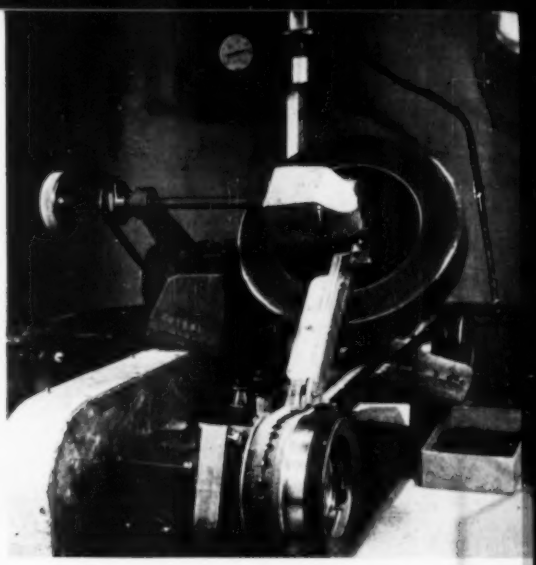


The alloy-gold barrel-plating unit incorporates the necessary controls, filter, agitation unit and containers for addition solutions, resulting in an efficient, compact production unit.

One of eight semiautomatic paper-belt-grinding units for rough (220 grit) or finish (320 grit) grind. Uniform belt tension is obtained by a pressure-controlled air cylinder. Solenoid-actuated air valves permit rapid belt changes.

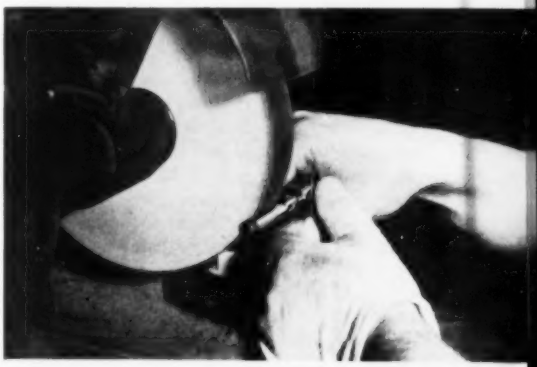
Loading of gold plated clips to chain hangers for conveyance through the processes of clear-lacquer dipping, infra-red drying and automatic ejection. Excess lacquer is removed from the hangers by being conveyed through solvent. The lacquer is used for additional protection of the merchandise while in dealers' stock.





(Left) **A foot-valve-operated** liquid-grease applicator fed from a central supply system supplies lubricant to the paper belts. (Right) **A smooth, highly reflective** surface on the heads of plastic buttons is produced by passing parts through an atmosphere of methyl acetone and steam. Parts are hopper fed into a split belt conveyor. Automatic ejection of parts is accomplished by spreading the split belt apart.

240-grit buffer (greaseless) finishing of caps, using high-speed ball-bearing holder with adjustable carboloy mask to obtain accurate width of the bright cap band. Soft buffs are run at a surface speed of 7500 ft/min to produce a satin-white appearance.



Plastic tote boxes, designed for cross stacking and high tiering, permit parts and colors to be seen at a glance. The additional advantages of cleanliness and light weight has resulted in a decision to incorporate this style box in as many departments as possible.

100 per cent visual and mechanical inspection of pen parts prior to assembly. Similar lines are located throughout the plant for 100 per cent inspection after assembly. Roving inspectors spot check all in-process operations.

Recovery of Chromic Acid from Plating Operations*

F. R. KELLER, *Plant Manager;* C. C. CUPPS, *Engineer;* AND R. E. SHAW, *Plating Supervisor,*

Standard Steel Spring Company, Newton Falls, Ohio

Many authors have pointed out that the design of an industrial waste-disposal plant starts with a reappraisal of plant layout and processes.

The present paper describes a case in point. At the Standard Steel Spring Company's Newton Falls, Ohio plant, installation of a recovery system has already resulted in the reduction of 55 per cent in the amount of chromic acid lost by dragout. Not only has this materially reduced the load on the treatment plant and saves some $1,650 monthly on ferrous sulfate used for treatment, but has paid off in reduced chromic acid consumption at the rate of $2,500 monthly. The recovery system cost approximately $10,000 to install, and operating costs are about $500 per month. Even though the recovery plant has not been operating consistently at its designed efficiency, it had paid for itself three months after installation.

Not every chromium plating operation would yield such spectacular savings from a similar installation, but wherever dragout represents a substantial proportion of the chromic acid consumption, the situation will be very similar. It is suggested that many operators would be surprised if they were to calculate the amount of chromic acid corresponding to the chromium deposited during a month and compare this figure with actual chromic acid consumption.

At Newton Falls, where automobile bumpers are plated automatically, the dragout is quite heavy, owing to the cup formed at the bottom when a bumper is hung vertically. Each bumper carries with it from $\frac{1}{4}$ to 1 pint (120–470 ml) of solution, which represents a considerable fraction of the daily usage of chromic acid. The following percentages represent the use of chromic acid with a double recovery tank before any further recovery system was installed:

	Per Cent
Chromic acid actually used to deposit chromium	5.7
Miscellaneous losses including those in fume exhaust (estimated)	20.0
Dragout	74.3
Total	100.0

The successful use of a recovery tank depends upon an appreciable quantity of the dragout liquor being returned to and used in the plating or process tank. Normally the only use for dragout liquors in a plating tank is to replace loss of solution by evaporation, because the dragin is equal to the dragout on the work being processed. Decorative-chromium plating tanks, however, are usually operated at 110–125° F, which results in very little evaporation.

To improve the operation of the recovery tanks at Newton Falls, the amount of solution continuously taken from these tanks was increased materially; first, by reducing the dragin to the plating tank and, second, by installing an evaporating unit to reduce the volume of the dragout solution before adding it to the plating tank.

The diagram of the installation (Fig. 1) shows the two rinses (tanks 4 and 5) preceding the plating tank and the three cold rinses (tanks 7, 8 and 9) and final hot rinse (tank 10) following it. This normal rinsing cycle has been altered as follows:

(1) Tank 4 is operated normally, i. e., full and overflowing to the sewer.

(2) Tank 5 is operated empty. Blow-off fixtures (Fig. 2) remove by a blast of air the bulk of water carried in the bumpers.

(3) Tank 7 is also operated empty. In it the bump-

*Presented at 24th Annual Meeting of the Federation of Sewage and Industrial Wastes Associations, Washington, D. C., October 8–11, 1951. Reprinted with permission Sewage and Industrial Wastes, February, 1952.

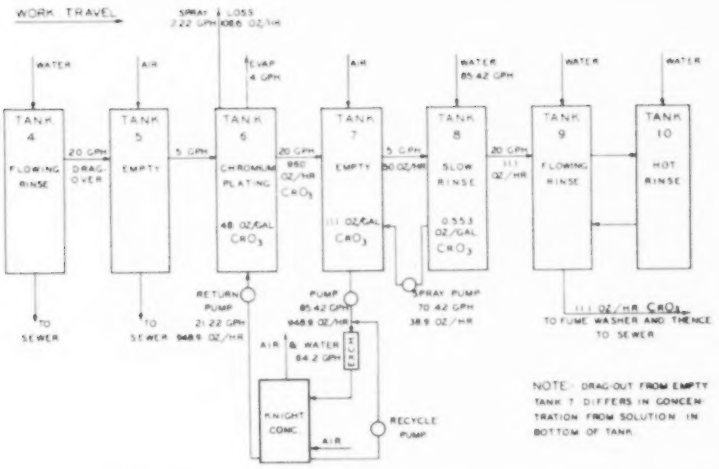


Fig. 1. Flow sheet of recovery system showing designed flow rates and equilibrium concentration of chromic acid

ers are first rinsed by a spray, which is arranged, mechanically, to operate intermittently, i. e., when the carrier is in proper position. The diluted dragout now carried by the bars is then blown off by air-jets as in tank 5.

(4) Tank 8 is operated full, but not overflowing. The sprays for tank 7 are fed from tank 8 by means of a small centrifugal pump, and only enough fresh water is added to tank 8 to replenish this spray water and the normal dragout. Thus the only portion of the chromic acid dragout which finds its way to waste is that dragged out of tank 8. The primary object then is to keep the concentration in this tank to a minimum.

Referring again to Fig. 1, it will be seen that the efflux from tank 7, containing the bulk of the chromic acid dragout, is pumped through a flow meter and heat exchanger to the concentrator. A portion of the concentrate is recycled and the rest returned to the plating tank substantially at plating-bath concentration. It will also be seen that the chief work by the concentrator is to evaporate the water used by the sprays in tank 7. Provided that both blow-offs are equally efficient so that the dragin from tank 5 equals the dragout from tank 7 and that the evaporated solution has the approximate composition of the plating bath, there is always room for it in the plating tank.

It may be observed that it would be very desirable to blow off the bulk of the concentrated solution over the plating tank itself, but for mechanical reasons that was not practical.

The design of the evaporator system presents a major problem owing to the corrosive nature of hot chromic acid. In the past, attempts have been made to concentrate chromic acid dragout in open steel or lead-lined tanks, using lead steam coils. Invariably these have wound up on the scrap heap because of corrosion. Without some method of providing enough room in the plating tank for the return, it has often been necessary to concentrate it to a sirupy liquor which was difficult to handle and very corrosive when hot, even to lead. These operations were usually performed batchwise, and because even dilute chromic acid at boiling temperatures attacks lead, especially at the air-liquid junction, this attack occurred all down the side-walls as the liquid level fell during evaporation. In addition, the lead coils became heavily encrusted, which interfered with the heat transfer.

In the present design, a Maurice Knight concentrator (Fig. 3) is used in which air is introduced below a bed of berl saddles, while the hot (but not boiling) liquid is trickled down from the top. The air picks up moisture and carries it out at the top, passing first through another thin layer of smaller saddles to remove entrained chromic acid.

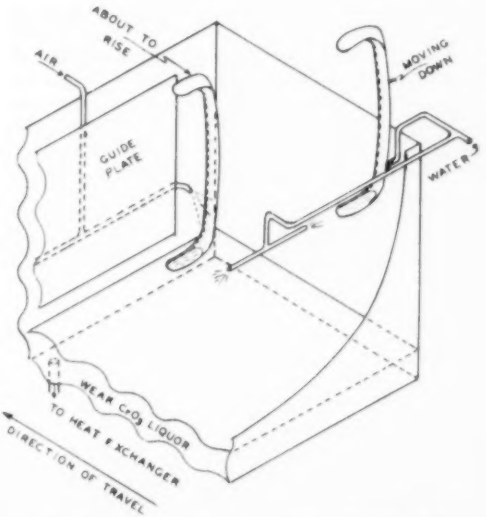


Fig. 2. Diagram of spray and blowoff in Tank 7

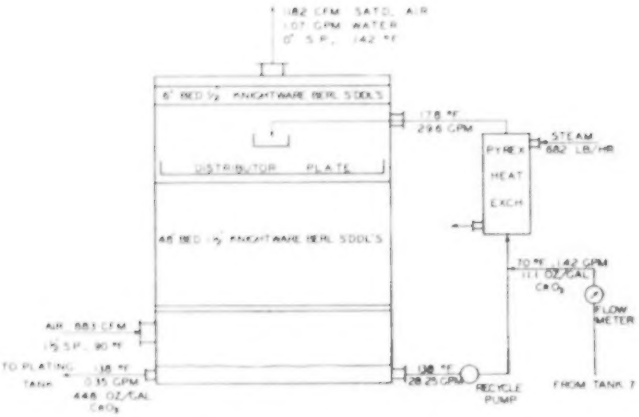


Fig. 3. Diagram of Knight Concentrator for chromic acid recovery

At first it was thought that it would be satisfactory to operate the heat exchanger with steel tubes, which would be expendable but cheap. The loss of tubes and consequent shut-down, however, proved excessive, and a Pyrex glass heat exchanger is now being used. Low-temperature pipe lines are iron, and all pumps are Duriron. One interesting feature is the use of Teflon envelopes surrounding the gasketing materials at the flanged joints of the Pyrex glass assembly. A Teflon envelope is used, shaped like a flattened inner tube but open on the outside diameter. This permits the insertion of a split gasket of any convenient material, which is then effectively insulated from the action of the solution.

It has already been observed that the function of the concentrator is to evaporate the water which is added to tank 8 and used for the sprays in tank 7. Since the ultimate loss of chromic acid is controlled by the equilibrium concentration in tank 8, it is essential to keep this concentration at a minimum. This is done by making the flow of fresh water and spray equal to the evaporation capacity of the concentrator. One can calculate what savings in chromic acid are possible for a given size evaporator, and thus choose the most economical size for the job. Due allowance must be made for the savings in disposal-plant installation and operating costs.

Without going into detail, the recovery system was designed on the basis of the data shown in Table I and Fig. 1.

According to the data in Table I, the dragout from the plating tank, 60 lb of chromic acid per hour, would be a total loss if no recovery of any kind were used. By actual measurement at different times, it was determined that the double-rinse recovery tanks were saving ½ of this dragout, or 30 lb chromic acid per hour. The use of the evaporator and the combination spray-and-blowoff arrangement has reduced this loss again by over 50 per cent, corresponding to a total saving of at least 45 lb of chromic acid per hour. Recent checks have shown that the loss may be as low as 3 lb of chromic acid per hour using the latter method of operation.

Other means of recovering the dragout have been proposed, such as vacuum evaporation and ion exchangers. All of them, including the one described here, have the advantage that the waste-disposal problem is handled right at the source by reducing the waste concentration before the waste is being treated.

Acknowledgment

The authors wish to thank Dr. A. Kenneth Graham, of Graham, Crowley and Associates, Inc., for his many suggestions and help in this undertaking.

TABLE I. DESIGN DATA

	Transfer or Dragout gal/hr	CrO_3 Concentration oz/gal	CrO_3 Dragout or Transfer lb/hr
Dragout from plating tank 6	20	18	60
Dragout from rinse tank 8 – loss	20	6.1	3
Water feed to rinse tank 8	85.4	0	0
Dragoff from empty tank 7	85.4	11.1	59.2
Vapor from concentrator	64.2	0	0
Return to plating tank 6	21.2	44.6	59.2

55 PAGES OF FACTS ON HOW TO CUT YOUR SMALL PARTS FINISHING COSTS

Now you can get up-to-the-minute news on the very latest developments in barrel-finishing — the fast, modern, economical process that deburrs, removes scale, tool marks and flash, and produces surface finishes and radii to blueprint specifications.

Norton Company's brand new booklet covers the subject thoroughly in 55 liberally illustrated, fact-filled pages — describes in detail every phase of barrel-finishing — tells you what to do, *and what not to do*, for best results.

PARTIAL LIST OF SUBJECTS

TYPES OF EQUIPMENT . . . CLEANERS . . . ROUGHING . . . RUST PREVENTIVES . . . FINISHING . . . PROCESSING OF SAMPLES . . . SEPARATION OF WORK FROM ABRASIVE . . . WASHING . . . DRYING . . . RESCREENING OF ABRASIVE . . . MIXING DIFFERENT PARTS.

GET THIS MONEY-SAVING INFORMATION

The new booklet also tells you how Norton ALUNDUM* tumbling abrasive — especially developed to meet industry's wartime needs for fast, efficient small parts finishing — has become a standard barrel-finishing medium in plants throughout the country.

Learn how this tough, hard abrasive helps you to shorten tumbling cycles, reduce scrap and reworking, and gives you consistently better finishing of parts ranging in size from tiny rivets to larger castings. Ask your Norton distributor or representative for your free copy of "Barrel-Finishing With ALUNDUM Tumbling Abrasive," or write us direct.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors In All Principal Cities

EXPORT: NORTON BEHR-MANNING OVERSEAS INC.
Worcester, Mass. New Rochelle, N. Y.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products to make other products better

Every mode of transportation – from baby carriages to the luxury liners that slice the waves – relies on *plated* surfaces not only for decoration but for protection of vital parts against wear and rust. And for these longer-lasting, more uniform plated finishes builders of bicycles, motorcycles, automobiles, trains, trucks, ships, planes look to Hanson-Van Winkle-Munning and Platemanship.

What does Platemanship mean? It means H-VW-M's unique array of assets . . .

. . . a modern laboratory geared to work with all industry in developing and perfecting improved, more efficient plating processes, equipment and supplies

. . . the ability to assume entire responsibility for *all* plating needs from polishing brushes to low-voltage generators to fully-automatic precision plating conveyors designed and built to specifications and using specially formulated processes

. . . a background of thorough knowledge of every phase of plating, polishing, buffing, cleaning and anodizing which has grown steadily since the inception of the industry.

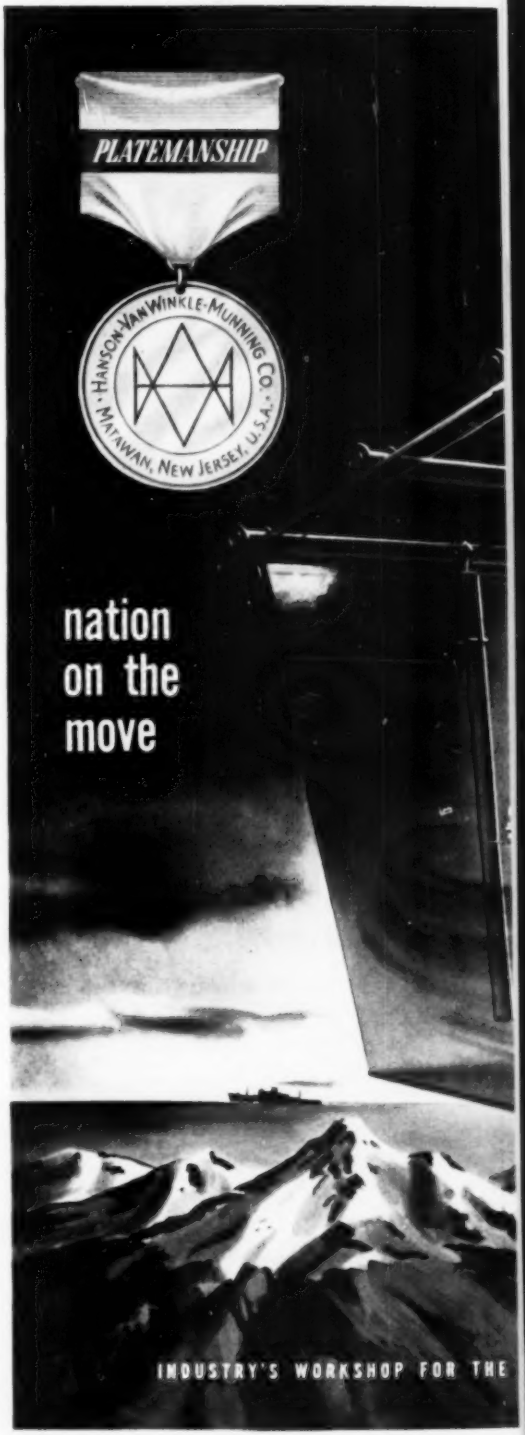
The field of transportation is only one phase of modern life that looks to H-VW-M's Platemanship for precision and uniformity. *All* industry relies on H-VW-M for sound advice and dependable, complete service on every plating and polishing need.

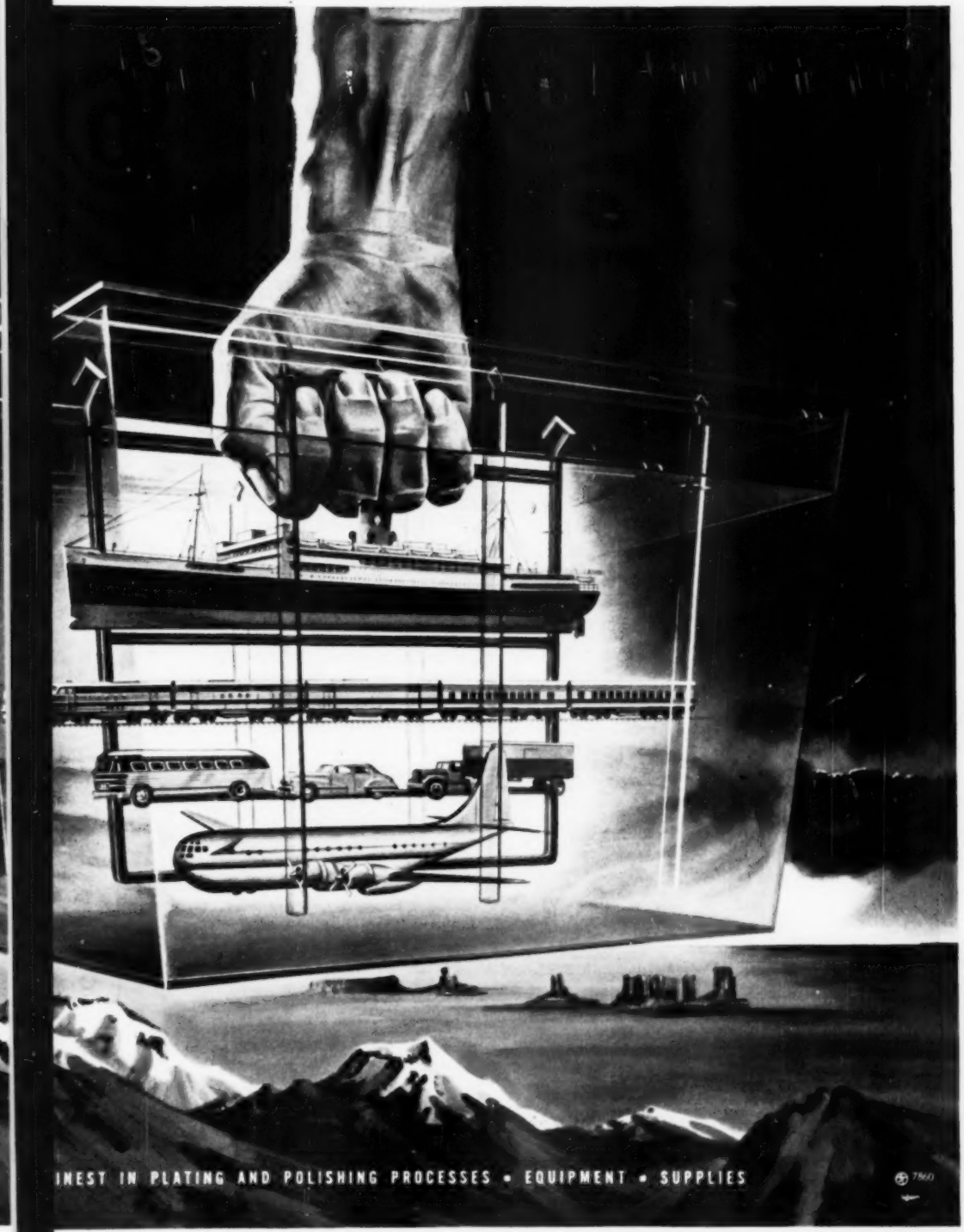
HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N. J.

PLANTS AT MATAWAN, N. J. • ANDERSON, INDIANA

SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • MATAWAN • MILWAUKEE • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SPRINGFIELD (MASS.) • STRATFORD (CONN.) • UTICA

H·VW·M




INEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

FOR PLATING STEEL

UNIQUE CLEANERS IMPROVE RESULTS—SAVE MONEY

Diversey No. 909 and No. 12 are two outstanding cleaners specially developed to provide superior finishes on steel surfaces through better, more thorough cleaning performance.

No. 909 and No. 12 are easily applied to a variety of different cleaning routines. No. 909 is a unique heavy duty soak tank cleaner. No. 12 is an electrocleaner for both direct and reverse current. The following case history is typical of the results you can expect through the application of Diversey No. 909 and No. 12.

TUBULAR STEEL FURNITURE CASE HISTORY

PROBLEM: To clean polished steel tubular furniture prior to bright nickel and chromium electroplating.

FORMER PROCESS: Included mineral spirits soak, handwipe, spray wash, alkaline soak and two electrocleaning operations. Six men, working steadily, were required.

PRESENT PROCESS: Includes Diversey No. 909 soak, and Diversey No. 12 reverse current electroclean.

RESULTS: The Diversey Process completely removes oil and grease from the inside of the tubes, avoiding contamination of pickle and nickel tanks as characterized the previous process. The cleaner tanks now are dumped every two weeks rather than every week as was formerly necessary. The No. 909 and No. 12 are the only materials this leading finishing plant has found that would eliminate the solvent and handwipe operations. The elimination of handwiping labor costs results in an estimated savings of $15,000.00 per year. A definite improvement in smoothness and luster of the electrodeposit resulted with Diversey No. 909.

COMPLETE INFORMATION AVAILABLE

For additional information, including technical bulletins, write or call your Diversey D-Man. He will be pleased to work with you. Write or call today. *The Diversey Corporation, Metal Industries Department, 1820 Roscoe Street, Chicago 13, Illinois. In Canada: The Diversey Corporation (Canada) Ltd., Lakeshore Road, Port Credit, Ontario.*

Diversey

Corrosion Resistance

(Continued from page 148)

fore they were placed on exposure. Each had 0.00125 inch (32 μ) of total plate and was exposed for 12 months at Detroit. These panels showed little or no corrosion at the scribe marks, indicating that deep holes are associated with local defects in the plate or metal. It is thought likely that inclusions are responsible for those in the magnesium-alloys.

In general, corrosion resistance increases with plate thickness. It is, however, far from being a straight-line function, and of course varies with the base metal. Fig. 5 shows 12-month ratings plotted against the total plate thickness. At Pittsburgh the corrosion resistance of the plated zinc alloy increases rapidly with an increase in plate thickness from 0.0005 to 0.0008 inch (13 to 20 μ) and from there on at a more moderate rate. On the other hand, very little protection is offered by as much as 0.00125 inch (32 μ) of plate over the aluminum or magnesium alloys, but very good protection is afforded by increasing the plate thickness to 0.002 inch (51 μ).

At Detroit the same general pattern holds, but the corrosion is not quite so severe. The magnesium alloy shows an improvement over the aluminum alloy for plate thicknesses below 0.002 inch (51 μ). Zinc-alloy is much better with plate thickness under 0.002 inch (51 μ), but with 0.002 inch (51 μ) of plate it is actually slightly poorer than the aluminum or magnesium alloy.

At Miami all the base metals afford a small to moderate increase in corrosion resistance with an increase in thickness from 0.00125 to 0.002 inch (32 to 51 μ). Increasing thickness from 0.0008 to 0.00125 inch (20 to 32 μ) shows a large increase in corrosion resistance for the zinc alloy and for Alcoa No. 85, a moderate increase for Alcoa No. 380, and no increase for the magnesium alloy. The relative corrosion resistance of the different base metals plated with 0.0008 inch (20 μ) of total plate is surprising here. The magnesium alloy is clearly first, Alcoa No. 380 second, the zinc alloy third, and Alcoa No. 85 fourth. We are unable to suggest an explanation.

In the rural atmosphere near Grand Rapids, zinc and magnesium show the greatest improvement on an increase from 0.0008 to 0.00125 inch (20 to 32 μ) of total plate, but the aluminum alloys improve most by the increase from 0.00125 to 0.002 inch (32 to 51 μ).

Fig. 10 shows the average progress of corrosion at all sites with 0.0005, 0.0008, 0.00125 and 0.002 inch (13, 20, 32 and 51 μ) of total plate over the zinc, magnesium and aluminum alloys. The bottom graph in Fig. 6 shows the same for 0.00125 inch (32 μ) of total plate over the three different aluminum alloys.

Effect of the Zinc Immersion Coating

The findings of this project as to the relative corrosion performance of plate over the different base metals appear to be quite clear cut. It should be kept in mind, however, when the present state of the art of

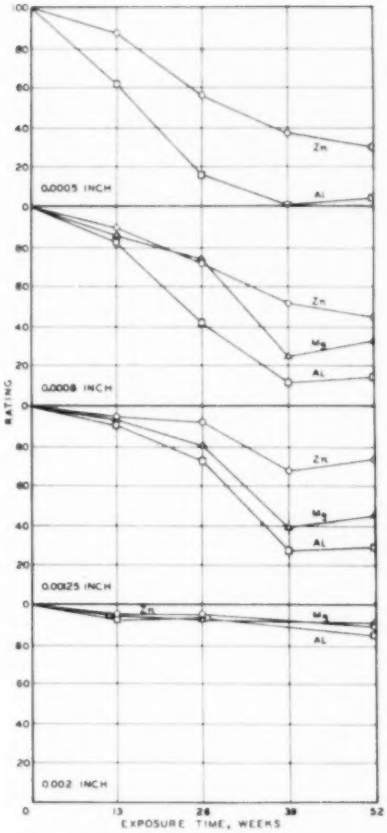


Fig. 10. Effect of time of exposure on average rating in all locations of zinc alloy Zamak 3 (Zn), magnesium alloy Dowmetal R (Mg) and aluminum alloy Alcoa No. 85 (Al) with varying total thickness of plate

plating on aluminum or magnesium alloys is considered, that there is a strong possibility that the method of plating could be responsible for any shortcomings in corrosion resistance. For example, the immersion zinc process for plating on aluminum and its alloys has been reported by F. Keller[2] to be very critical as to the amount of zinc deposited. He indicates that when over 0.15–0.25 mg/in^2 (1.0–1.6 mg/cm^2) of zinc is applied on wrought aluminum and followed by copper, nickel and chromium, corrosion at a scratch through the plate spreads across the interface causing rapid loss of adhesion over a considerable area. In the plating of the diecast aluminum-alloy panels used in this program it was necessary to use 0.12 to 0.56 mg/in^2 (0.8 to 3.6 mg/cm^2) of zinc to overcome the effect of the porosity of the castings. The corrosion resistances of the three plated aluminum alloys proved to

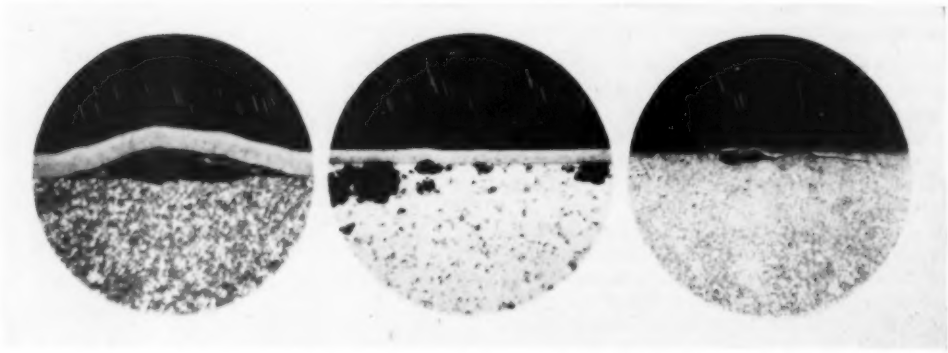
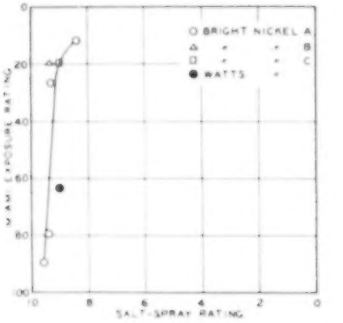


Fig. 11. Microsections of blistered coatings on aluminum alloys. From left to right: over area of MS 2410B (S-1) alloy containing casting mark (200X); due to separation fault in MS 2410D (S-9) alloy (60X); due to porosity of MS 2412 (Alcoa No. 218) alloy (200X)

be in the reverse order to the amount of zinc used. It is not known that Keller's value applies to the die-cast metals, but there is reason to believe that the corrosion resistance would have been better had it been feasible to plate the castings using less zinc. A separate investigation is to be carried out to study the effect of this variable.



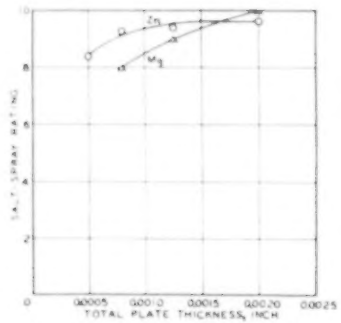


Fig. 12. Correlation between 200-hour salt-spray rating and, top, 52-week outdoor-exposure rating of zinc alloy Zamak 3 and, bottom, total plate thickness on zinc alloy Zamak 3 and magnesium alloy Dowmetal R.

The diecast panels, both of the magnesium and the aluminum alloys, showed defects such as metal-flow lines, laps, porosity, and oxide flakes. Apparently, several factors contributed:

1. These metals are harder to cast than the zinc alloy.
2. Thin flat panels are difficult objects to cast.
3. The art of diecasting magnesium and aluminum alloys is not as advanced as the art of diecasting zinc alloys.

Fig. 11 shows microsections through blisters which appeared in the plating on cast panels of aluminum alloys. It can be seen that the blisters are actually due to the base metal. The Alcoa No. 218 panels, only one set of which was included, showed visible fine porosity in the plate before exposure, reflecting the condition of the base metal. There is a good chance, therefore, that the inferior quality of the magnesium- and aluminum-alloy panels as compared to that of the zinc-alloy panels would have a strong influence on their corrosion resistance.

Most of the conclusions resulting from this work should, therefore, be understood to apply to magnesium and aluminum alloys as diecast and plated according to the present state of the art, rather than to any inherent qualities of these base metals.

Correlation with Salt-Spray Results

In general, there was no correlation between the salt-spray and the exposure-test results. Fig. 12, top, shows some degree of correlation of salt spray with exposure at Miami Beach for plated zinc alloy. Four different nickel plates are involved here, namely, three different bright nickels and Watts-type nickel. Note, however, that the difference in salt-spray rating is very small compared to the difference in exposure rating. The bottom graph of the same figure shows a degree of correlation between salt spray and plate thickness on plated zinc and magnesium alloys. Here again, the differences in salt-spray ratings are very small compared to the differences in thickness.

Minimum Thickness of Plate

Fig. 13 shows the amount of plate required to give a "T" rating of 75 (considered a minimum for a satisfactory performance over zinc, aluminum and magnesium alloys exposed at each of the four sites for periods of 3, 6, 9, and 12 months. Note that to withstand 6 months of exposure at Pittsburgh a 0.002-inch (51-μ) plate is required over aluminum or magnesium alloy, and a 0.00125-inch (32-μ) plate over zinc alloy. A 0.002-inch (51-μ) plate over any of these base metals will withstand 12 months of exposure. The thickness requirements to withstand exposure in a marine or a rural atmosphere are surprisingly alike.

Types of Corrosion

There appear to be two major types of corrosion. One acts by actually attacking and pitting the plate itself, even though it be of perfect quality; this occurs with extreme rapidity at Pittsburgh, and is believed to be caused by sulfur dioxide and other acid gases produced mostly by combustion of coal. This attack may be aided by galvanic action between cinders or other solid particles ("fly ash") and the plate, and later on by the corrosion products themselves. This type of corrosion is characterized by dark-brown to black corrosion products.

The other type acts by corroding the base metal through pores in the plate, mainly owing to galvanic action between the plate and the base metal. This type of corrosion occurs most rapidly at Miami, where the moist salt atmosphere furnishes a good electrolyte. It is characterized by white, or in the case of the magnesium alloy light-gray, corrosion products.

The corrosion at Detroit is mainly of the same type as at Pittsburgh, but there is also an appreciable amount of the type occurring at Miami. The white corrosion products are usually masked somewhat by the black.

The corrosion at Grand Rapids is very slow, and is more like the Miami type.

On plated zinc-alloy panels that have been cleaned, the pits are very numerous but small; on the plated magnesium alloy, they are few but large and deep; on the plated aluminum alloys, especially Alcoa No. 218, they result in loss of adhesion, which spreads rapidly from the pits.

Effect of Buffing the Nickel

As stated before, it is known from previous tests that buffing of bright-nickel plate over zinc alloy with lime composition results in early and severe staining of the plate in industrial atmospheres; but it apparently closes some pores and results in better performance over a longer period of time. The performance in a marine atmosphere is greatly improved by buffing.

Over aluminum alloy, the effect of buffing the bright-nickel plate may be studied by comparing the ratings for lots 2A(85) and 2DA(85) in Table III. Buffing seems to have little, if any, effect.

Over magnesium alloy, buffing the bright-nickel plate may be studied by comparing the ratings for lots

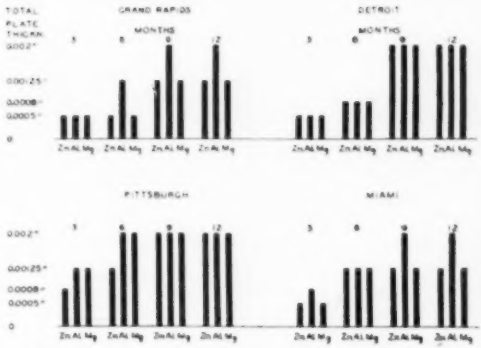


Fig. 13. Bar graph showing total plate thickness on zinc alloy Zamak 3 (Zn), aluminum alloy Alcoa No. 85 (Al), and magnesium alloy Dowmetal B (Mg) necessary to give a T-rating of 75 after 12 months of exposure

3M and 3DM. Here also there is no practical effect. The 12-month ratings show that buffing had a beneficial effect at Detroit but an adverse effect at Pittsburgh, which effects offset each other for practical purposes.

Watts vs. Bright Nickel

In a comparison of buffed Watts nickel with bright nickel, the averages of the 12-month ratings from all locations show that the buffed Watts nickel is slightly better over all three base metals. When one looks at the 12-month ratings in the different locations, however, it is seen that over zinc alloy buffed Watts nickel is much poorer in a heavily industrial atmosphere and much better in a marine atmosphere.

Over aluminum alloy, an 0.0008-inch (20-μ) plate provides very insufficient protection, and the comparison is therefore not significant. However, for what it may be worth, the 26-week ratings indicate the buffed Watts nickel to be slightly, but definitely, superior to the buffed bright nickel in all locations.

Over magnesium alloy, a 0.00125-inch (32-μ) plate furnishes the basis for comparison, although it is considered an insufficient thickness. Here, too, the buffed Watts nickel is slightly, but definitely, better in all locations than the buffed bright nickel.

To summarize, the following conclusions have been drawn:

Conclusions

1. To provide adequate protection against corrosion of zinc-, aluminum-, or magnesium-base diecastings for one year, a total plate thickness of 0.002 inch (51 μ) was necessary.

2. On zinc-base diecastings, the protection given by the plate was proportional to its thickness; however, the additional protection gained by depositing more than 0.00125 inch (32 μ) was comparatively small.

3. In general, the protection of the aluminum or magnesium alloy for one year afforded by a 0.00125 inch (32μ) thick plate was very inadequate; but the

TABLE III. RATING AVERAGES FOR PANELS EXPOSED AT DETROIT (D.), PITTSBURGH (P.), MIAMI BEACH (M.) AND GRAND RAPIDS (G.) AND IN A SALT SPRAY BOX

Chromium thickness on all panels: 0.00001 inch

Base Metal	Lot No.*	Copper inch	Nickel inch	Uncleaned Panels														
				13 weeks					26 weeks					39 weeks				
				D.	P.	M.	G.	Av.	D.	P.	M.	G.	Av.	D.	P.	M.	G.	Av.
Zinc alloy	1Z	0.0002	0.0003B	97	70	82	100	87	76	1	54	92	56	42	36	24	45	37
	2Z	0.0003	0.0005B	97	76	88	100	90	84	34	74	98	72	46	47	55	62	52
	2AZ	0.0003	0.0005Wb	97	77	82	100	89	67	60	80	98	76	44	38	78	88	62
	3Z	0.0005	0.00075B	97	83	96	100	94	87	86	96	99	92	62	58	90	58	67
	4Z	0.0005	0.0015B	97	90	98	97	95	92	92	98	99	95	89	68	98	58	78
Aluminum alloy	1A(85)	0.0002	0.0003Bb	89	34	40	87	62	5	17	8	33	16	0	0	0	0	0
	2A(85)	0.0003	0.0005Bb	90	64	80	99	83	58	18	30	61	42	2	0	10	35	12
	2A(380)	0.0003	0.0005Bb	95	60	92	98	86	57	10	70	74	52	0	0	66	51	29
	2AA(85)	0.0003	0.0005Wb	94	78	86	100	89	68	31	74	97	67	0	0	66	56	30
	2DA(85)	0.0003	0.0005B	94	69	80	98	85	61	40	42	74	54	2	10	10	44	16
	3A(85)	0.0005	0.00075Bb	95	77	88	100	90	80	54	74	92	72	0	0	52	58	27
	3A(380)	0.0005	0.00075Bb	95	81	96	97	92	88	44	84	85	75	8	10	78	56	38
	3A(218)	0.0005	0.00075Bb	96	78	88	100	90	89	30	74	86	70	0	0	48	18	16
	4A(85)	0.0005	0.0015Bb	94	80	96	100	92	92	87	92	100	93	95	76	84	84	85
	4A(380)	0.0005	0.0015Bb	95	89	100	100	96	98	90	98	100	96	92	72	94	82	86
Magnesium alloy	2M	0.0003	0.0005Bb	91	68	86	100	86	82	53	74	97	74	0	0	68	32	25
	3M	0.0005	0.00075Bb	92	88	92	100	93	90	66	76	97	80	34	2	72	47	39
	3AM	0.0005	0.00075Wb	92	85	94	99	92	88	86	92	100	91	48	0	92	97	59
	3DM	0.0005	0.00075B	90	72	96	100	89	94	65	82	96	84	23	6	72	67	42
	4M	0.0005	0.0015Bb	91	85	100	99	94	92	82	98	97	92	81	85	98	83	87

Base Metal	Lot No.*	Copper inch	Nickel inch	Uncleaned Panels						Cleaned Panels			Average Salt-Spray Ratings
				52 weeks					Gr. Av.	52 weeks			X10 200 hours
				D.	P.	M.	G.	Av.		D.	P.	M.	
Zinc alloy	1Z	0.0002	0.0003B	38	0	42	70	30	52	62	30	52	84
	2Z	0.0003	0.0005B	45	40	27	68	45	65	55	51	42	92
	2AZ	0.0003	0.0005Wb	38	15	64	77	48	69	43	53	78	90
	3Z	0.0005	0.00075B	67	54	80	92	73	80	70	57	87	94
	4Z	0.0005	0.0015B	66	57	90	97	77	86	77	81	100	96
Aluminum alloy	1A(85)	0.0002	0.0003Bb	0	0	0	15	4	20	0	26	6	90
	2A(85)	0.0003	0.0005Bb	0	0	10	49	15	38	34	30	14	90
	2A(380)	0.0003	0.0005Bb	0	0	42	53	24	48	19	27	44	90
	2AA(85)	0.0003	0.0005Wb	0	0	56	70	31	54	40	27	56	80
	2DA(85)	0.0003	0.0005B	0	0	10	52	15	42	32	35	10	90
	3A(85)	0.0005	0.00075Bb	0	0	55	62	29	54	47	45	55	96
	3A(380)	0.0005	0.00075Bb	0	0	62	57	30	59	42	45	62	96
	3A(218)	0.0005	0.00075Bb	0	0	22	24	11	47	0	0	22	76
	4A(85)	0.0005	0.0015Bb	90	74	68	97	82	88	90	85	68	96
	4A(380)	0.0005	0.0015Bb	89	85	82	97	88	91	89	88	82	96
Magnesium alloy	2M	0.0003	0.0005Bb	8	0	65	59	33	54	19	65	65	80
	3M	0.0003	0.00075Bb	28	0	65	88	45	64	49	48	77	90
	3AM	0.0005	0.00075Wb	72	0	86	95	63	76	85	81	90	90
	3DM	0.0005	0.00075B	8	39	62	78	52	68	58	68	72	100
	4M	0.0005	0.0015Bb	91	84	90	94	90	91	91	80	100	100

*Numbers within parenthesis refer to Alcoa alloy numbers.

degree of protection was increased tremendously by an additional 0.00075 inch (19 μ) of plate. The one exception was the magnesium alloy in a rural atmosphere, the behavior of which closely paralleled that of the zinc alloy.

4. Corrosion of the plated aluminum alloys progressed along the interface of the plate and the base metal, once there was any break in the plate.

5. Corrosion of the plated magnesium alloy progressed into the base metal, forming craters of ever-increasing size which erupted voluminous grey corrosion products.

6. Aluminum alloy Alcoa No. 380 was slightly better than Alcoa No. 85 as a base for plate. Alcoa No. 218 was a very poor third.

7. Buffed Watts nickel over the zinc alloy was much poorer than unbuffed bright nickel in a heavily industrial atmosphere, and much better in a marine atmosphere. The averages of the ratings for all locations indicated that the buffed Watts nickel was very slightly better overall.

8. Over aluminum alloy Alcoa No. 85, for a total plate thickness of 0.0008 inch (20 μ), buffed Watts nickel was slightly, but definitely, better than buffed bright nickel in all locations.

9. Over the magnesium alloy, for a total plate thickness of 0.00125 inch (32 μ), buffed Watts nickel was slightly, but definitely, better than buffed bright nickel in all locations.

10. Over aluminum and magnesium alloys, buffing of the bright-nickel plate had no practical effect on the corrosion resistance.

11. Corrosion of a plated zinc-base diecasting is not so objectionable as corrosion of a plated aluminum- or magnesium-base diecasting, because the corrosion products can be easily polished off the plated zinc alloy, resulting in an acceptable appearance marred only by very small pits; the plated aluminum, so polished, shows large blisters; the plated magnesium shows fewer, but larger and deeper, pits.

12. Very little correlation was found between salt-spray-test results and either exposure-test results or thickness of plate. Some degree of correlation was shown between salt-spray results and Miami Beach-exposure results on the plated zinc alloy, and between salt-spray results and thickness of plate on the plated zinc and plated magnesium alloys; but the difference in salt-spray ratings was very small in each case.

Acknowledgment

We wish to thank Mr. Milton B. Hammond and the Standard Steel Spring Company for their generous cooperation in making the exposure site at Coraopolis, Pa., near Pittsburgh, available to us for this project.

References Cited

[1]Report of Subcommittee II of Committee B-8, Proc. Am. Soc. Testing Materials **49**, 231 (1949).

[2]F. Keller and W. G. Zelley, J. Electrochem. Soc. **97**, 143-151 (1950).

Book Review

DR. HAROLD J. READ

Associate Professor of Metallurgy, Pennsylvania State College

Chrome Dur (1950-1951 volume) edited by Paul Morrisset, 64 pages. Centre D'Information du Chrome Dur, Grand Palais, Porte C, Paris (8e).

This collection of papers (in French) contains two articles relating to hardness, two on hard chromium as applied to cutting tools, one on the plating of gages, and one on the analysis of chromium plating baths. These occupy about two-thirds of the volume, the remainder being devoted to announcements, comments and bibliographies.

A paper on the use of the pendulum method for the determination of the hardness of chromium deposits contains an excellent discussion of the theoretical aspects of the subject and summarizes the requirements which must be fulfilled by the testing equipment. The pendulum method of hardness testing has not been much used in America, at least so far as metals are concerned, and this paper should, therefore, be of considerable interest. A limited quantity of data indicates that significant measurements can be made on relatively thin deposits. Much more work is required to evaluate fully this new method for measuring the hardness of chromium deposits. The second paper on hardness is a long report of an extensive study of the manifold factors which affect both the hardness of chromium deposits and the results which are obtained from indentation hardness tests on a given deposit. The author, A. Mittene, appears to be well aware of the complexity of a seemingly simple problem, and his work has been well planned and executed with due regard for these complexities. The data which are quoted were obtained from both plant- and laboratory-scale operations.

The first paper on the chromium plating of cutting tools is merely a brief recital of the advantages of so doing. The second contribution comprises a limited quantitative discussion of the forces involved in the cutting operation as well as the geometry of tool wear. It is suggested that the role of the chromium deposit is not only a matter of reducing wear through the reduction of friction but also involves a change in the form of the triangular opening which the tool makes in the metal ahead of its point, thereby deflecting the situs of wear from the cutting point itself.

A report on changes in profile of thread gages as the result of chromium plating to various thicknesses is presented along with a few data from similar investigations on snap gages.

The paper on the spectrophotometric analysis of chromium plating baths is partly a brief discussion of the principles involved in an analysis of this sort and partly a qualitative and rambling "plug" for the technique. There are no specific directions and the description of the apparatus is exceedingly brief.

INDUSTRIAL FINISHING EXPOSITION GETS UNDER WAY

One-Third of Floor Space Sold in 1st Month

More than one-third of the exhibit space at Chicago's INTERNATIONAL AMPHITHEATRE has been reserved by exhibitors participating in the 3rd Industrial Finishing Exposition, sponsored by the American Electroplaters' Society. The Exposition, scheduled for June 16-20, 1952, is expected to attract at least 20,000 purchasing and production executives.

Clyde Kelly, Exposition and Convention Chairman, has announced that hundreds of products and services in electroplating and fifteen allied fields will be displayed at the Chicago Exposition. Initial plans undertaken by the joint Committee indicate that the Trade Show will be the largest in the history of the Society. The scope of the event has been enlarged to cover the exhibition of abrasives, automotive plant transportation, basic chemicals and metals, industrial tapes, material-handling equipment, polishing and buffing equipment and supplies, testing instruments, and publications dealing with metal finishing.

According to Mr. Kelly, every effort is being made to offer exhibitors the greatest advantages in displaying their products and services. In developing the floor plan for the Exposition, which includes the Arena and the North Wing of the INTERNATIONAL AMPHITHEATRE, the Committee reserved approximately 50,000 square feet for broad aisle space. This insures ample room for material and crowd movement and guarantees exhibitors the opportunity to show their wares and to talk to buyers.

Exposition Headquarters, which is located at 35 E. Wacker Drive, Chicago, Ill., announced recently that over one hundred requests for booth space had been received prior to the distribution of official layout brochures and space contracts.

The Exposition office also revealed that a huge publicity program on behalf of the INDUSTRIAL FINISHING EXPOSITION OF 1952 is now under way. The plans include the issuance of stories and articles for trade publications and newspapers, radio and television interviews and announcements, and promotional advertising tie-ins. All available media will be utilized to attract the finest audience.

Careful screening of Exposition visitors and registrants will be made for the protection of exhibitors and their personnel. Constant emphasis will be placed on inviting only men and women from industry who influence the buying habits and procedures of their respective companies.

As part of the promotional program of the Exposition, 250,000 mailing stickers printed in three colors have been produced and are being distributed to exhibitors and Secretaries of the forty-six Branches of the American Electroplaters' Society.

Hours for Exposition attendance have also been announced. The schedule is as follows:

Mon.,	June 16	12 Noon to 10 P.M.
Tues.,	June 17	9 A.M. to 5 P.M.
Wed.,	June 18	12 Noon to 10 P.M.
Thurs.,	June 19	9 A.M. to 5 P.M.
Fri.,	June 20	Exhibitors "get-away day"

The Educational Sessions of the 39th Annual Convention of the *American Electroplaters' Society* will be conducted at the famed STOCK YARD INN, adjacent to the INTERNATIONAL AMPHITHEATRE. These sessions are a vital portion of the Convention, which will otherwise be held concurrently at Chicago's Conrad Hilton Hotel (formerly the Stevens). More than two thousand Convention registrants are expected to attend the Educational Sessions. Free bus service between the Hilton and the Amphitheatre is being provided for Convention registrants and exhibitors.

Facilities for free parking of 4,000 automobiles has also been arranged by the Exposition Committee. Parking space is lighted and patrolled.

The *A.E.S. Research Committee* will maintain an extensive exhibit at the Exposition. Harold J. Wiesner, Chairman of the Committee in charge of the Research Exhibit, points out that the primary purpose of the exhibit will be to acquaint large numbers of industrial representatives with the accomplishments of the Society and with its research work.

Another educational exhibit already past the planning stage will be that of the *Chicago Electro-Platers' Institute*. Methods of plating on various metal objects, as well as a display of metal finishes, will be shown. The job-shop platers organization has announced that its display will be unique and extremely mobile.

The following are but a few of the products to be exhibited:

abrasive belts and abrasives, adhesives, air compressors, air heaters, anodes, booth-cleaning compounds, booth coatings, buffing compounds, buffs, burnishing barrels, conveyors, degreasers, dipping machines, electrical controls, enamels, exhaust equipment, filters, generators, japans, laboratory equipment, lacquers, masking tapes, material-handling equipment, baking ovens, paints, plating chemicals and cleaners, plating barrels, plating racks, plating machines and plating tanks. Additional products include:

polishing and buffing machines, polishing grain, polishing wheels, radiant-heating equipment, rectifiers, scales, safety equipment, sand-blasting equipment, tank rheostats, temperature controls, temperature indicators, testing and inspection equipment, protective clothing, varnishes, waxing equipment, wire brushes, and wire wheels.

According to a statement issued by the IFE Committee, exhibitors at this event will have an unequalled opportunity to meet and talk to more customers and prospects during the four-day Exposition than in five hundred days of personal calls made on an individual basis. It is for this reason that the Exposition slogan takes on added meaning . . . "IT'S CHICAGO FOR YOU IN 1952!"

Exposition Chairman Clyde Kelly instructs H. E. Head, Vice-Chairman of the show, on how to lay out individual booth space in Chicago's International Amphitheatre. C. F. Nixon, President of the A.E.S., sponsor of the Exposition, takes notes to be included in the brochure showing completed floor plan.

project no. 11

project director:
JOHN KRONSBEIN*

location:
EVANSVILLE
COLLEGE,
EVANSVILLE, IND.

Acknowledgment is due the Research Committee, Dr. W. A. Wesley, The International Nickel Company, Chairman; the Research Directing Sub-Committee, Mr. G. M. Cole, Ternstedt Division, General Motors Corporation, and Dr. R. A. Schaefer, Cleveland Graphite Bronze Company, Chairman and District Supervisor, respectively; and the Project Committee, Dr. R. A. Schaefer, Acting Chairman; Mr. L. R. Westbrook, Consultant, Solon, Ohio, and Mr. R. W. Oyler, Guide Lamp Division, General Motors Corporation, for their contributions to this project.

*AUTHOR

Current and Metal Distribution in Electrodeposition

II. THEORETICAL CONSIDERATIONS

This report sets forth some simple fundamentals that the plater should know in order to grasp the significance of the general subject. It also presents known cases of uniform current and metal distribution, and discusses the results of theoretical investigations into the distribution on flat sheets and on angles.

A later report will attempt to conclude with specific recommendations for influencing the distribution of current, along the lines of the papers presented by Dr. Kronsbein at the Milwaukee (1949) and Boston (1950) A. E. S. Conventions, to which the reader is referred. This future report will depart from the expounding of mathematical laws, however simple, and deal directly with experimental findings and their relationship to theory. Much of the material in it will be useful to the designer as well as to the plater, and may eventually find its way into the draftsman's handbooks.

Introduction

It is not the purpose of this research to present a complete mathematical theory of current distribution but an elementary description of some underlying quantitative principles that will help to clarify the subject. The derivation of mathematical formulae is omitted, except in the case of Ohm's law.

The subject to be discussed in the present paper can be conveniently grouped under the following four headings:

Ohm's Law

Equipotentials and Current Lines, or Surfaces

Geometrical Arrangement of Electrodes with Uniform Current Distribution

Two Cases of Non-uniform Current Distribution on the Cathode

These are given by way of example. The theoretical distribution on the flat cathode has been known for a long time, but the actual formulae for calculating current distribution on the inside and outside corners are new, and provide some interesting information.

Ohm's Law

As in other fields of electrical science, one of the fundamentals in electrodeposition is Ohm's Law. It states that the electric current flowing in a conductor is directly proportional to the potential difference applied to the ends of a conductor, and inversely proportional to its resistance. Mathematically this is expressed as follows:

$$I = V/R \qquad (1)$$

where

I = current in amperes

V = potential difference in volts

R = resistance in ohms

Fig. 1 illustrates this relationship for the electroplater. The rectangular conductor is thought of as a tank, the two square ends of which are conductors, but the sides, bottom and top of which are

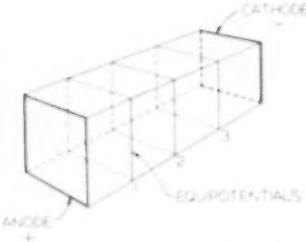


Fig. 1. Simplest electrolytic cell. The electrolyte occupies the entire box between anode and cathode. The sides are insulators. Current can only flow in straight lines from anode to cathode and is uniformly distributed

insulators. The ends are employed as anode and cathode, and the space is filled with an electrolyte of uniform composition. If a potential V (in volts) is applied to the electrodes, then, in the absence of polarization, the current I (in amperes) is directly proportional to the potential difference and inversely proportional to the resistance R (in ohms) of the solution between the electrodes.

The resistance of the solution, in this case, can be analyzed further. The electroplater knows that it is directly proportional to the length of the tank and inversely proportional to the area of the cross section, i.e., to the area of the electrodes. Finally, the resistance of the solution depends upon the characteristics of its components, its composition and concentration and can be set inversely proportional to a constant k called the "specific conductivity" of the solution. This information provides the following relationship:

$$R = L/kA \qquad (2)$$

where

L = distance between the electrodes
A = area of the cross section
k = specific conductivity

Equation 1 may now be re-written:

$$I = \frac{kA}{L} V \qquad (3)$$

From this expression, the *current density* "C.D.", i.e., the total current divided by the area of the electrodes, can be obtained. It is seen to be *proportional to the voltage drop per unit length of solution, or*

$$\text{C.D.} = I/A = kV/L \qquad (4)$$

The current density may be expressed in another way by saying that it is the potential drop per unit length in a direction *normal* (at right angles) to the electrode. Mathematically, this is described as the "normal derivative" of the potential function at the electrode where the current density is to be measured. It applies to all possible cases of electrode arrangements and is not limited to the one illustrated in Fig. 1. Thus, if the law, or equation, describing the potential or voltage distribution in the electrolytic cell is known, the current distribution on an electrode may be ascertained by simple differentiation.

As has already been indicated, there are limitations to the application of Ohm's law to electrolysis, because of polarization or filming of the electrodes and solution inefficiency or due to variations of concentration of solution in the vicinity of the electrodes, stratification, nonuniformity of the electrodes, and the like. Polarization is by far the most important factor involved in deviations of actual results from those predicated on Ohm's law. These other factors will not be considered further in theoretical discussions.

Current distribution obtained on electrodes in an electrolytic cell when both are at constant potential and polarization is absent will be referred to as "*primary*" *current distribution*. Deviation of current distribution from the primary will be considered, by definition, as due to polarization.

The result of electrode polarization is the same as if a non-constant potential were applied to the electrodes. When an electrode is polarized, its surface resistance to passage of current increases in a manner dependent upon the way the current is distributed over it. This increase in resistance is greatest in high-current-density areas. Reduction in current density therefore occurs at such places. The current is distributed over the electrodes more uniformly when polarization occurs. This is generally true. Polarization reduces the difference between maximum and minimum current densities on an electrode. Such an effect is called "uniformizing". Sometimes the electroplater employs devices that divert current from parts of the cathode and cause it to concentrate on other parts. They too are uniformizing means. Auxiliary anodes, metallic or insulating shields are examples. Such artificially introduced uniformizing of current distribution will not be considered as polarizing effects.

Equipotentials and Constant Current Lines or Surfaces

Equipotentials

The plane surfaces marked 1, 2, and 3 in Fig. 1 are called equipotentials. Either electrode could have been placed at any of these positions, and the only change produced in the cell would be the potential drop across it. In the absence of polarization, the total current and also the current density would remain unchanged if the voltage applied to the electrodes were reduced in proportion as the distance between the electrodes is reduced.

Therefore, it is apparent that an equipotential is a surface*, depending on cell geometry, on which the voltage as measured against either electrode remains constant. Such a surface may be ascertained in an electrolytic cell of any shape or size by means of an exploring electrode, or probe, and a voltmeter. The exploring electrode must be small compared to the size of the other electrodes, the degree of smallness depending upon the accuracy required in locating the equipotential. It is evident that the anode and cathode are each an equipotential.

An equipotential may be replaced by a conductor without altering such other conditions in the cell as current density on the electrodes or voltage drop between the electrodes. This statement may be more easily understood by the aid of the following explanation: Imagine an equipotential surface located by the method described. Then, a sheet of thin, suitably chosen metal may be put there without changing the voltage or current distribution in the cell. The sheet would become negative on the side facing the anode and positive on that facing the cathode; it would be a "bipole".

Constant Current Lines or Surfaces

It is evident that in the cell shown in Fig. 2 the current flows from the center anode to the circular cathode along the radii.

The positive or negative ions flow along such surfaces, or lines, as a result of the force exerted upon them by the potential gradient of the electric field. The current lines, or surfaces shown, being radii, are at right angles to the circular equipotential. This statement can be generalized: the current lines, or surfaces, along which the ions flow are always at right angles to the equipotentials, no matter how complicated the electrode arrangement may be.

Minimum Energy Principle

When the conductor is not of uniform cross section as in Fig. 1, the distribution of current at different places on the electrodes may vary. This is true of solid as well as liquid conductors. Current will not simply flow from anode to cathode along the shortest possible path, a straight line. Unlike the arrangement in Fig. 1, anode and cathode are generally not the ends of a conductor, but are immersed in the body of electrolyte. The entire body

*Where cross sections of cells are shown, the equipotential surface appears as a line or a curve.

will participate in carrying the current in such a manner that the total energy conversion becomes a minimum. Expressed differently, the current passing through a solid or liquid conductor is so arranged that there will be a minimum of energy lost as heat. This minimum-energy principle of current distribution through an electrolytic cell extends to, and includes, the electrodes.

Electroplaters consider as "current density" the total current divided by the total area of electrode; this is actually only an average value. In practice, current distribution varies from place to place on an electrode. Many examples are encountered where the deposit is thick in some places and thin in others. These places are known as "low-current-density areas" where the deposit is thin, "high-current-density areas" where the deposit is thick. A point or "very small area" is a special case of current density with mathematical significance. "Very small area" means so small an area that the introduction into the cell of an electrode of equal area will not measurably increase the total current passing through the cell. It is the express purpose of this research to ascertain just how variation of current density occurs on different shapes of cathodes, in different electrolytes, under various operating conditions, and especially at a representative number of average current densities frequently encountered in practice.

Effect of Insulator on Current Distribution

An insulator may be placed where there is a current line, or surface, without changing the potential or current distribution anywhere in the cell. There will be no current flowing into the insulator; it will flow only along a current line, or surface, so that the insertion of a very thin insulator along the current line, or surface, will not interfere with this flow of current. If the insulator is placed so as to intersect current lines, or surfaces, the current will flow along the surface of the insulator because it cannot get through it. Therefore, the current distribution will be changed in the cell by introduction of an insulator so as to cross lines of constant current.

Geometrical Arrangements of Electrodes with Uniform Current Distribution

Some known arrangements which give rise to uniform current distribution in the absence of polarization are in some cases of special interest to the electroplater. For simplicity, cells with only a single anode will be considered. Where examples conveniently illustrate the idealized electrode and cell arrangement, cross-sections through the cells are given, in Figs. 2–6.

An electrode will be considered to be "infinitely far" from another when no measurable change in current distribution occurs if it is moved still farther away. Either anode or cathode may be assumed to have potential zero. The potential of the other electrode then differs from this by a negative or positive constant, respectively. Only potential difference is measurable in practice, namely, voltage.

In all theoretical discussions it is assumed that the specific conductivity k of equation 2 is equal to one, and that the average current density on the cathode is one ampere per square foot unless otherwise stated. Therefore, a cylindrical cathode of radius one foot and one foot high has an area of 2π square feet. At an average current density of one ampere per square foot, the total current on such a surface would be equal to 6.28 amperes. As theoretical procedures rest essentially upon comparison of current distribution on a circular cathode with that on other shapes, the number $2\pi = 6.28$ is frequently used.

The following cases of uniform current distribution are noted, in which the electrodes are sections of infinitely long and parallel electrodes:

(a) *A thin wire cathode placed in a very large (infinite) tank of any shape with an anode infinitely far distant.* "Infinite" means that making the tank any larger or placing the anode farther from the thin wire cathode would not materially alter the current distribution.

(b) *A cylindrical cathode located in a circular cylindrical tank infinitely far from a thin wire anode.*

These two cases, (a) and (b), are a special example of infinitely spaced electrodes in an infinitely large tank or vessel.

(c) *A cylindrical cathode with a thin wire anode at the center of the circle outlining the cylinder.* The electrolyte fills the space between the electrodes. The bottom of the cylindrical vessel is an insulator. A cross section through the tank is shown in Fig. 2.

(d) *A cylindrical cathode with a concentric circular cylindrical anode.* The electrolyte fills the space between the anode and cathode. This arrangement is illustrated in Fig. 3. It differs from the one in Fig. 2 because the anode dimensions are comparable to those of the outer cathode, whereas the cell in Fig. 2 has a thin wire anode. In both of these cases the equipotentials are circular cylinders concentric with the electrodes. They are shown as broken circles in both diagrams. The total current passing through the cell is divided for convenience into eight equal parts as indicated by the radial lines. If these sectors are made smaller and smaller, they eventually shrink into radial lines. The very small sector in Fig. 2 illustrates this. The radial lines shown are of course also current lines along which the ions flow because of potential gradient between the anode and the cathode. In both cases, in the absence of polarization, the current density on the cathode is inversely proportional to the radius. This is made clear by the small sector in Fig. 2, through which the current flows. If the radius of the cathode were that of one of the smaller circles, the area would be directly proportional to the radius, and therefore, if the current through the cell is kept constant, the current density would change inversely as the radius. If r is the radius of the outer circle, the mathematical expression for the current density may be given by

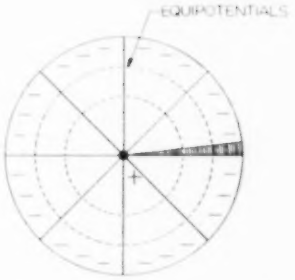


Fig. 2. Cross section of cylindrical electrolytic cell, in which the outer cell wall is the cathode and the center indicates a thin wire electrode. Equipotentials are lines of constant voltage in the cell. Current is uniformly distributed over the cathode

$$\text{C.D.} = \frac{1}{r} \qquad (5)$$

(e) *A rectangular tank with insulating bottom and two sides, the remaining two sides representing, respectively, anode and cathode.* This is shown in Fig. 4, which indicates several current lines fully drawn out and extending from anode to cathode, and several equipotentials as broken lines across the tank section.

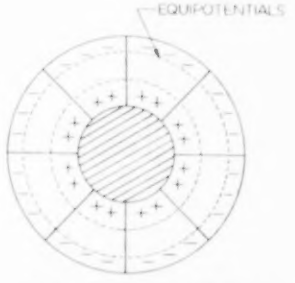


Fig. 3. Cylindrical electrolytic cell with inner cylinder representing the anode. Current is uniformly distributed on both anode and cathode

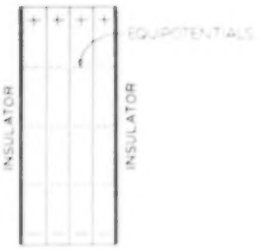


Fig. 4. Cross section through rectangular electrolytic cell. The long sides are insulators. The solid lines parallel to the insulators are narrow strips, each similar to the cell in Fig. 1. Equal quantities of electricity flow between any two such lines

f. A rectangular tank infinitely long in one direction with an anode infinitely far from its cathode. When the rectangular tank in Fig. 4 becomes infinitely long so that increasing its length does not materially change the current distribution on the electrodes, the arrangement illustrated by Fig. 5 is obtained.

g. Two very large flat plates immersed in a very large tank so as to be parallel to one another. This case is illustrated by Fig. 6. It is essentially the same as a very long tank with the two long sides as conductors and the distant ends and bottom as insulators. When two large plane electrodes are immersed in a large tank fairly close together and the current at the edges is disregarded, this case results.

This completes the enumeration of the known arrangements of one anode and one cathode with current uniformly distributed on the electrodes. It is not known whether additional cases exist which give uniform current distribution on either or both of the electrodes. Theoretical cases can be constructed for which uniform current distribution cannot be achieved, even by means of uniformizing devices, such as anode shapes or the introduction of auxiliary anodes. It is not known whether theoretical cases exist of cathode shapes on which uniform current density can be achieved by anode shape, but such arrangements seem probable.

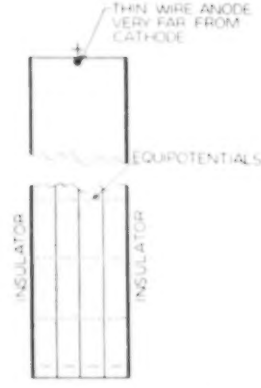


Fig. 5. Electrolytic cell of great length. It is similar to the cell in Fig. 4, in that the thin wire anode is so far from the cathode that it behaves as the anode in Fig. 4

Two Cases of Nonuniform Current Distribution on the Cathode

The cases of the flat cathode and of two strips or plates meeting at a line to form an inside and outside angle are of importance in practical electrodeposition.

The most convenient way to discuss current distribution on these cathodes is by way of example. It will be assumed that the anode is infinitely far away, i. e., so far away that putting it still farther away would not materially alter the current distribution on the cathode.

The Flat Strip Cathode

A cross section through the cathode together with the current distribution across it is plotted in Fig. 7. The diagram illustrates the flat cathode somewhat thicker than theory would assume it to be for the ideal case of an infinitely thin flat cathode. The height of the graph above the x-axis is proportional to the current density at the corresponding place on the cathode immediately underneath. The flat cathode is conveniently placed so as to extend from $x = -1$ to $x = +1$, along the x axis. The mathematical expression for current density is then given by

$$C.D. = \frac{1}{\sqrt{1 - x^2}} \qquad (6)$$

Fig. 7 is a plot of this equation for all values of x between $+1$ and -1. It is immediately seen that this theoretical formula makes the current density infinite for $x = -1$ and $x = +1$, i. e., on both edges. That is true for any sharp edge, no matter whether it is found on a flat strip or as a projection on some other object.

In Fig. 7, a straight line parallel to the section of the flat strip is drawn through the ordinate 1.57 ($= \pi/2$). This is the average current density on the strip. If the current were uniformly distributed over the entire flat plate, this line, instead of the curved line, would represent the current-density curve. The total area under this straight line is 3.14 units (i. e., amperes), which is the total current passing through one side of the strip. The number 3.14 ($= \pi$) is therefore also the area under the curve representing the actual current density. The cross hatched area under the "average current density line" in Fig. 7 is equal to the area of the two shaded portions on the left and right sides of the strip. Thus, the edges "steal" the current from the center portion.

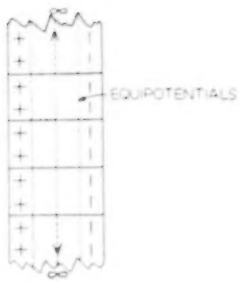


Fig. 6. Current distribution between two very large flat electrodes not very far apart is uniform except at the edges. The current may therefore be assumed to be uniform near the middle of each electrode

Generally speaking, one does not encounter true flat strips with infinite current densities at the edges. It is therefore of greater interest to discuss, theoretically, what takes place on sections that approximate flat strips or plates. From what has been stated previously, it may be inferred that the simplest procedure will be to select an equipotential. (It will be recalled that an equipotential may be replaced by a conductor—a bipole—without changing anything else in the cell.) After this has been done, the cell may be thought of as consisting only of the equipotential and the (far distant) anode. This equipotential is not a true flat strip,

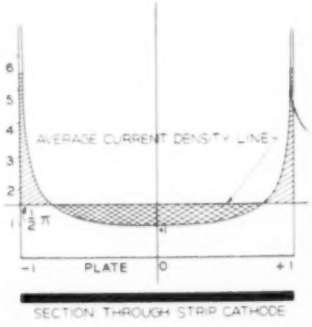


Fig. 7. Current distribution on the side of very thin flat strip. Note the high current density at the edges of the strip

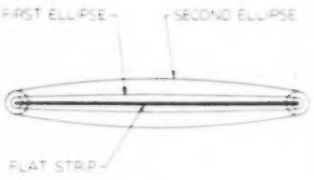


Fig. 8. Real flat strip is not infinitely thin. Simplest approximation in a theoretical study is a strip of elliptical cross section.

but it resembles one very closely if it is chosen sufficiently near the surface of the flat strip. Two cross sections are illustrated in Fig. 8. The current density expression may be found from the same potential-distribution law that applied in the case of the infinitely thin flat strip. However, the equation is considerably more complex than equation 6 and will be discussed only qualitatively in the paper. The equipotential is shaped like an ellipse that hugs the flat cathode. It is rounded at the ends of the major axis or the edges of the strip, so that it departs some from the ideal flat strip with rounded edges. The radius of curvature, or the fillet radius, can be computed without difficulty, and then the current density at the strip edges may be derived. The results of such theoretical calculations are given in Table I, together with the ratio of the major to minor axis of the two ellipses shown. The diagram in Fig. 8 shows the radii of curvature and the osculating circles.

The last row of the table shows the current densities at the midpoint of the strips when the total current is constant. In Fig. 7 and in the first column of the table, the data applies to a very thin ellipse with relatively sharp corners. Thus, the rounding of the edges helps to even out the deposit—it uniformizes the current densities as the other columns of the table show.

The last column shows that the ellipse at that stage is no longer a good approximation to a flat plate. The radius at the edge is 0.1 unit whereas the strip is 0.3 unit thick at the center. A true flat strip has a thickness equal to twice the radius at the edge, not three times, as with this approximation. Its sides are also parallel until the edge is reached. This approximation, therefore, resembles more closely a strip tapered from the middle out towards the edges, which are rounded.

Two Strips meeting at a Line to form an Inside and an Outside Angle

If an angle of arbitrary aperture and of equal shank lengths, formed by two infinitely thin strips meeting to form an inside and an outside angle, or sharp

TABLE I. CURRENT DISTRIBUTION ON ELLIPTICAL STRIPS

	Radius of Fillets in Units				
	0.00001	0.0001	0.001	0.01	0.1
Ratio: Thickness to length of ellipse	0	0.01	0.032	0.10	0.31
Current density at edge of elliptical strip, asf	∞	100	31.4	10.0	3.24
Current density at middle of elliptical strip, asf	1	1.01	1.03	1.1	1.31

corner, is placed in a very large tank with the anode far away and with current allowed to flow between the electrodes metal will be deposited on both the inside and the outside of the angle. The theory of this case has been worked out by the present author, but the results are quite complex and will be omitted from this paper. The general conclusions from these mathematical calculations appear to be as follows:

(a) *End of each shank.*—The current density at each edge or at the end of each shank is infinite. The angle behaves similarly to a flat strip at the edges.

(b) *Inside corner.*—On the inside corner of a true sharp angle, the current density is zero, regardless of what the aperture may be. This is true even though the angle is shallow, say, 179 degrees. However, the rate of reduction to zero in the corner changes with the angle aperture.

(c) *Outside corner.*—On the outside corner of a true sharp angle, the current density is infinite regardless of what the angle aperture may be. Again, the rate at which infinite current density is reached differs for different angles, and attains a maximum for the sharp edge, which may be regarded as a completely folded-over angle, i.e., an angle with inside aperture zero and outside aperture 360 degrees, i.e., a flat strip.

(d) *Distribution of current between inside and outside surfaces of the angle specimen.*—This relationship can be conveniently illustrated by the following mathematical description.

Let q be the fraction of 360° representing the outside angle of the folded specimen. It is clear that q will be equal to 0.5 if the angle is 180°, greater than 0.5 but less than 1 for all angles up to 360°, and exactly equal to 1 for the completely

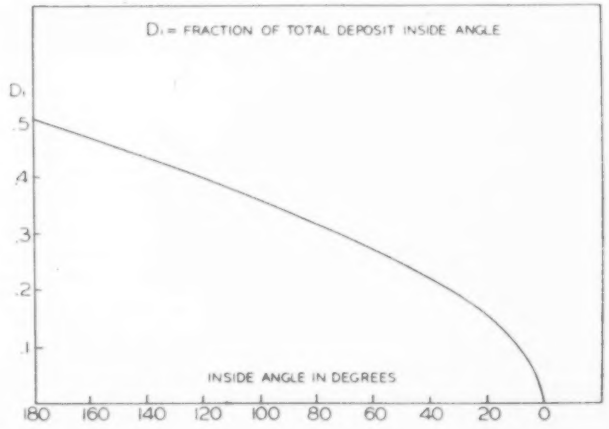


Fig. 9. Fraction of total deposit inside an angle plated both outside and inside is reduced as the angle becomes more acute. This graph shows at what rate this reduction takes place.

Specialists in Industrial Cleaning Products

Pre-Fos®—another helpful Wyandotte Chemicals product at work

New Wyandotte phosphating cleaner ups production 50%, saves dollars!

You're looking at steel fishing rods that used to require four stages in their production cycle before painting. Now they take only three!

Thanks to a Wyandotte Sales Supervisor and Pre-Fos, a new Wyandotte Chemicals phosphating cleaner, one stage is eliminated. Production time is cut, valuable shop room is saved and better cleaning and paint preparation is obtained.

Read what Murrie Betts, of the Betts Manufacturing Company, says: "We're completely sold on Wyandotte Pre-Fos for phosphating steel. It cleans better, deposits a fine-grained phosphate coating which helps hold paint and prevents rust. It speeds up our phosphating 50%, is cheaper and lasts longer."

Investigate Pre-Fos

If you are painting or rust-proofing metals, investigate Wyandotte Pre-Fos.

Also look into the fine Wyandotte Chemicals line of products for burnishing and burring, vat, electro, steam-gun, and washing-machine cleaning, paint stripping, acid pickling, phosphating, related surface treatments and spray booth compounds. And ask about Wyandotte Zorball, all-purpose floor absorbent.

Write us for free technical help and direction on any of your cleaning problems. There is no charge or obligation for this helpful service. *Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles, California.*

CLEANING THE WORLD

®REG. U.S. PAT. OFF.

Largest manufacturers of specialized cleaning products for business and industry

Wyandotte CHEMICALS

Helpful service representatives in 88 cities in the U.S. and Canada

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 235.

folded over angle of 360°. Mathematically, angles are measured in radians as well as in degrees, 360° being equal to 2π radians; in other words, a radian is approximately 57.3°. Thus $2\pi q$ is the *outside* angle and $2\pi(1 - q)$ is the *inside* angle.

Then it can be shown mathematically that the fraction of the total deposit found on the *outside* of the specimen is

$$D_o = 1 - \frac{1}{\pi}\cos^{-1}(2q - 1) \qquad (7)$$

and that the fraction of the total deposit found *inside* the angle of the specimen is

$$D_i = \frac{1}{\pi}\cos^{-1}(2q - 1) = 0.318\cos^{-1}(2q - 1) \qquad (8)$$

Fig. 9 shows graphically the reduction of deposit inside the angle, with the latter measured in degrees. It may be emphasized once more that these expressions are derived subject to the assumption that there is no polarization.

(e) *Filleted inside angle or corner.*—The first approximation between current density and fillet radius on the inside angle is given by the following relationship:

$$\text{C.D.} = \frac{R}{12.3} \qquad (9)$$

where R = fillet radius in inches
C.D. = current density in asf

This fillet-radius relationship is applicable only to radii of less than 0.05 inch, providing the shank length of the specimen is at least 1 inch, i. e., sufficient to approach the average current density (of 1 asf). It is apparent that the radius of the inside corner is related to the current density by a linear relationship. That means that for every factor of increase in the inside fillet radius the current density will be increased by a corresponding factor.

(f) *Filleted outside angle or corner.*—The approximate relationship between current density and outside fillet radius is given by the equation:

$$\text{C.D.} = \sqrt[3]{\frac{12}{R}} \qquad (10)$$

The formula has the same significance as the inside-fillet equation and is in error with an outside radius of above 0.05 units. This equation corresponds to the inverse cube law. Therefore, increasing the radius by eight times only doubles the current density.

The experimental researches now being performed on current and metal distribution will disclose the deviations of commercial baths from the theoretical.

Washington Orders

Copies of NPA orders and publications may be obtained from National Production Authority, Washington 25, D. C., or from any of its local offices.

Availability.—Issue No. 4 of the List of Basic Materials and Alternates, which appeared on December 28, 1951, contains no changes in the listing of the metals of interest to platers. However, basic lead carbonate, red lead oxide, litharge and trichlorethylene have been added to Group I, in short supply; and plastic-type nylon has been moved from Group I to Group II, in approximate balance. Alternates suggested for nickel-chromium plate are bright-zinc plate, extrafine aluminum lining pigment, suitable synthetic enamel, aluminum-base baking enamel.

Cadmium.—Producers now have a 2-month supply on hand of this metal, and the Cadmium Producers and the Cadmium Distributors and Consumers Industry Advisory Committees have recommended that the controls in Order M-19 be relaxed. Of the 8,000,000-lb annual production, the military are likely to absorb only 30 per cent.

Copper.—The Brass Mill Products Distributors Industry Advisory Committee, on December 4, reported that the supply of copper bars and rods was extremely tight whereas copper sheet was in reasonably good supply.

Second-quarter, 1952, military copper requirements are said to be 81 million pounds in excess of fourth-quarter, 1951, requirements.

The electrolytic corrosion encountered at welded joints of copper and aluminum can be overcome by silver plating of the joint, according to members of the Fluorescent Lamp Ballast Industry Advisory Committee.

Hydrofluoric acid.—It has now been proposed to issue an order limiting most civilian uses to 100 per cent of 1950 consumption. The consumption was 78,000,000 lb in 1950, and is estimated at 88,000,000 and 105,000,000 lb in 1951 and 1952 respectively.

Inventories.—Amendment 1 to NPA Reg. 1, dated December 14, added aluminum sulfate, barium and lead chemicals to Table IA, Materials subject to Practical Minimum Working Inventory.

Lead.—The worsening shortage of lead had led to the issuance of an Order M-93 conserving the use of lead in storage batteries.

Operating supplies, installation.—According to CMP Reg. 5 as amended on December 20, expendable jigs and fixtures used on production equipment are included under operating supplies. A manufacturer may now obtain materials needed for installation of equipment, including 200 lb of copper per installation, on a priority basis.

Polyethylene.—A shortage will be felt in February because one of the two producers will shut down his plant while new equipment is being installed. The military took 20.3 per cent of the Dec allocations.

Rubber.—The restrictions on rubber materials were eased greatly by amendment of Order M-2 on December 14.

Selenium.—A new order M-91, dated December 10, 1951, put selenium under allocation, except that users of 1 lb or less per month may self-certify. Inventories are limited to 1-month supply. Selenium is used in rectifiers; in production of low-temperature enamels, paints, plastic and lacquer; and for other purposes.

Sulfur and sulfuric acid.—By amendment of Order M-69, on December 29, 1951, the use of sulfur for any purpose is restricted to 90 per cent by weight of the average monthly use for such purpose during the year 1950, but use of less than 20 short tons per month by any person is exempted from this provision.

According to Order M-94, issued on December 29, 1951, each producer must offer for sale each month a percentage of his scheduled monthly production of sulfuric acid equal to the percentage thereof which he sold in 1950. Schedule 3 to Order M-45 was revoked on the same date.

PARAMOUNT BRAND

FELT WHEELS

...TOPS IN "Contourability"

Are you finishing articles which require a wheel with a "shaped" or contoured face? Don't forget that felt wheels lend themselves to contouring probably better than any other type of wheel. Don't forget, too, you have nine degrees of hardness to choose from when you buy Bacon Felt Wheels—The Paramount Brand. Ask your supply house for Paramount Brand Felt Polish Wheels.

Send for Our New Catalog

BACON FELT COMPANY

407 West Water Street — Established 1825

TAUNTON — MASSACHUSETTS

"America's Oldest Felt Manufacturer" — "Felt Does It Better"

Your Supply House can Furnish Bacon PARAMOUNT BRAND FELT BOBS & WHEELS

Schorithene

FLAME-SPRAYED
CORROSION-RESISTANT
POLYETHYLENE-LINED DRUMS

Better - Yet Costs Less!

Seamless *Standard*

Platers are enthusiastic about these new corrosion-resistant drums for operations where they formerly used breakable glassware and crocks . . . dipping, storing, plating, filtering, etc. . . . for practically any chemical used in the plant!

Schorithene is a seamless plastic lining made of polyethylene powder with the patented Schori Flame-Spray Pistol . . . the most corrosion-resistant material available today. Bonds firmly to metals, assuring long life; easy to clean. Drums coated on outside with plastic paint as protection against splash and drip.

Order Schorithene-lined drums directly from us or your distributor. See price list. Prices F.O.B. Long Island City; orders accepted from rated companies, otherwise payment with order. No COD's.

PRICE LIST

Gallon Cap.	Inside Diam.	Inside Height	List Cost
	STANDARD		
3½	11"	9"	$7.50
5	11"	12"	9.50
15	15"	20"	17.50
20	18"	20"	24.50
30	18"	27"	29.50
55	22"	34"	36.50
	SEAMLESS		
30	18"	27"	40.00
50	22"	34"	52.00

Covers $4.00 extra

Custom Spraying of Tanks, Pumps, Agitators, etc.
Distributor Territories Open

SCHORI PROCESS DIVISION
FERRO-CO CORPORATION
VERNON BLVD. AND 43rd ROAD
LONG ISLAND CITY 1, N. Y.

USE READER SERVICE CARD, INDICATE A 237.

QUESTION BOX

readers' questions of general interest

Q. 136. We silver plate parts fabricated from rectangular brass tubing, ½ x 1-inch x 8-12 inches long. Some of these units are closed on one end by means of a brass plug soft-soldered into the tubing; others are open; many are curved or bent. These parts go directly from the cleaning cycle into the silver strike, then the silver-plating solution, omitting a copper flash. We are experiencing lack of silver adhesion to the exposed solder at the plug and of full silver coverage on the inside of the plugged tubing. Can you suggest a method to eliminate these troubles?

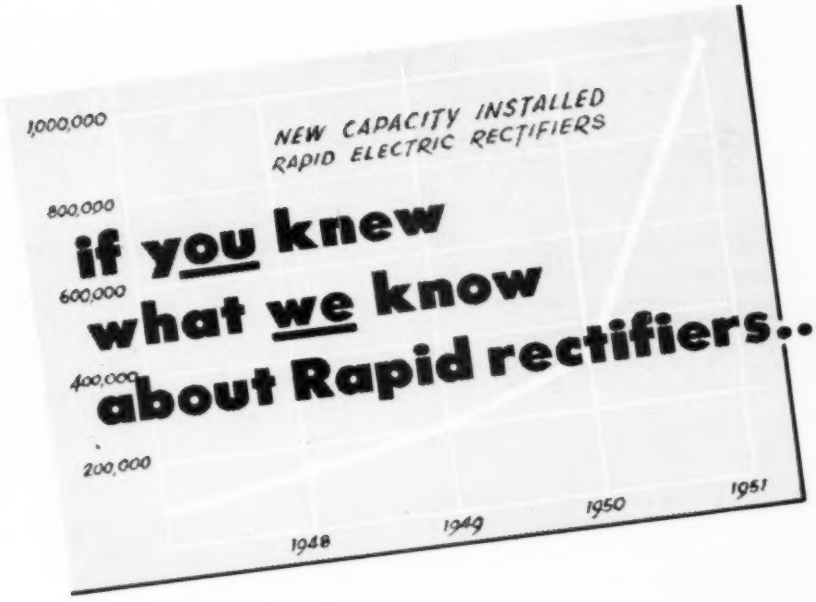
A. It is possible that your difficulty is insufficient cleaning on the inside of the closed tube, and you should, therefore, take all possible steps to assure that such cleaning is satisfactory. Solvent-vapor degreasing might serve the purpose if the tubes are racked so that the solvent that condenses on the inside drains free.

Probably the best acid dip for activating soft solder is a solution of fluoboric acid, which should be followed by thorough rinsing. It is also very desirable to copper flash the solder. An arrangement similar to the one described below for silver plating may be necessary.

Although the silver cyanide solution has excellent throwing power, it cannot be expected to throw into the closed-end tube. Normally, one would expect that a brass surface should take a silver immersion deposit, but the inside of the closed-end tubing is very likely to become anodic, preventing such a deposit, and certainly preventing any possible plating. The only solution that we can see to the problem of plating the inside is to use an inside steel anode or an inside silver-plated steel anode, with separate current control through an ammeter. If a heavy deposit is required, the solution within the tubing may become exhausted of silver rather rapidly, and it may be necessary to use for anode a fine steel tubing and push fresh solution through it by means of a pump.

To prevent short circuiting and provide some degree of centering, the anodes should be put through the holes of some insulators anchored onto the anode at substantial distance from each other. The anode will have to be moved the distance of the diameter of the insulators after half of the plating time has elapsed in order that reasonably uniform coverage be obtained.

—D. G. Foulke, H. L. Pinkerton.



if you knew what we know about Rapid rectifiers...

You would know the reasons for this steady increase in their use from year to year.

For we who design . . . build . . . and test these rectifiers know the quality and durability engineered into every part.

We know, therefore, why people who have tried RAPID once, come back again and again—until their plating installations are powered and controlled *entirely* by RAPID.

Our new catalog gives the facts about RAPID products and services. May we send you a copy? Just ask for Bulletin RP-51.

Designed to Last!

Built to Last!

Tested to make sure!

RAPID ELECTRIC CO.
2881 MIDDLETOWN ROAD, NEW YORK 61
distributors in major cities

SAVE
CHEMICALS and HEADACHES in
Your BRIGHT ZINC PLATING with

McKeon's
Zinc-Brite

Reduces frequency of proprietary brightener additions. Compatible with ALL brighteners.
Cuts immersion time and quantity of bright dip chemicals consumed.
INSURES UNINTERRUPTED CONSTANT BRIGHT ZINC PLATING THRU CONSTANT SOLUTION PURIFICATION.
Effectively cleanses your zinc solution of copper, cadmium, lead, tin, mercury, and like contaminations as fast as they get into your electrolyte either from the anodes, work, or external sources.
Prevents harmful accumulation of carbonates.
No filtering required. No waiting period. Economical.
ORDER A 15-GALLON DRUM—$42.75—
ON 30 DAYS' APPROVAL

Sulphur Products Co. Inc.
Greensburg Pa. 8

Bright zinc may replace your present nickel-chrome finish.

USE READER SERVICE CARD: INDICATE A 239.

Zialite
Reg. U. S. Pat. Off.

for HARD CHROMIUM

USE
Zialite ADDITION AGENTS
Harder deposits.
Increased throwing power.
Less sensitivity to sulfate content.
Exceptionally fine results plating anything calling for Decorative or Hard Chrome.

for NICKEL PLATING

The one bath especially designed for plating DIRECTLY on ZINC, LEAD ALUMINUM, BRASS, COPPER and IRON.

ZIALITE CORPORATION
92 Grove Street Worcester 5, Mass.

USE READER SERVICE CARD: INDICATE A 240.

Article Abstracts

No copies of articles are available at the offices of "Plating". Photostats may be had from libraries having files of the journal in question and offering photostat service, usually at 30-50 cents a page. Ask your public library to consult the Union List for names of libraries having the particular journal. Abbreviations used are those of Chemical Abstracts.

Choose the Right Nickel Plating System. Anon. Steel **128**, 94–96, 117–132 (June 4, 1951).

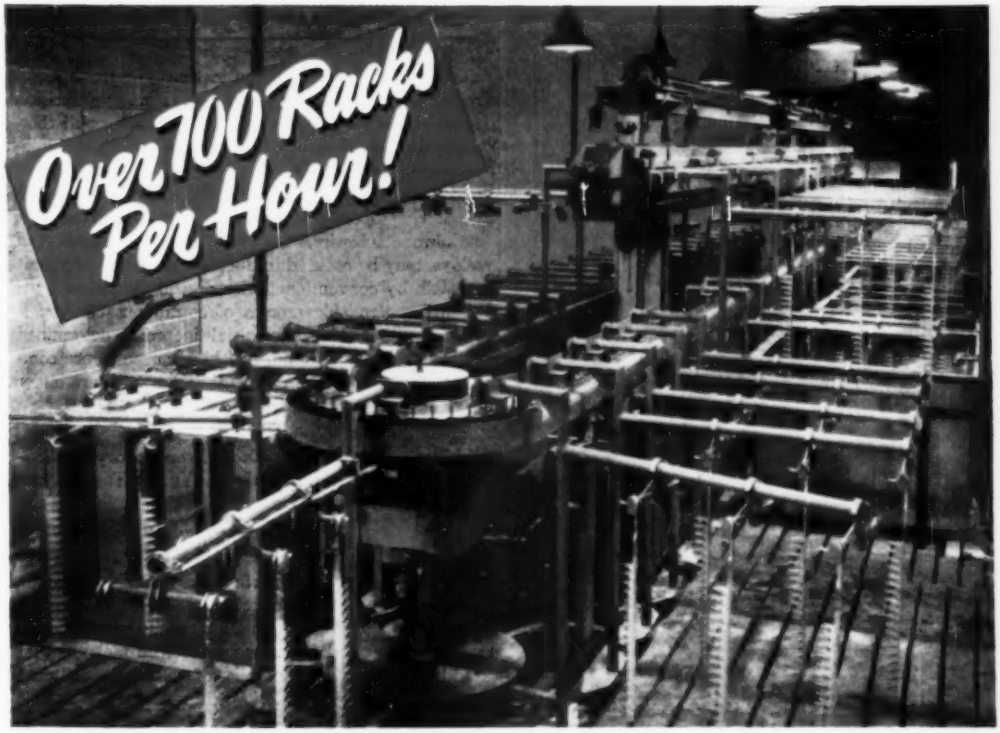
Limitations on the use of metal point up the necessity for realizing the full potentialities of nickel in applications still permitted under NPA regulations. The wide range of properties of nickel deposits obtainable under controllable variations of plating conditions makes the metal suitable for an ever-increasing list of uses where it functions as a decorative protective finish or in engineering applications. Thus, soft, ductile nickel can be deposited with a good bond for subsequent fabrication and corrosion protection. Special types of nickel plating baths have been developed which tend to minimize surface imperfections in the base metal; such deposits tend to "smooth" the surface during the plating operation. The corrosion resistant characteristics of nickel can be attained on the surface of base metals used in the construction of tanks, machinery, and parts handling corrosive products to minimize maintenance costs and retain purity of the product. Worn parts, rebuilt to size with nickel deposits, have in many instances been found to possess better properties and furnish longer operation life than the original article. Nickel can be plated on plastic and other nonconductive material to combine favorable properties. The nickel plating processes which have been developed for various applications are described.

Preparation of Very Fine Wire by Electropolishing. W. H. Cohner, M. Feinleib, and H. T. Francis. Metal Progress **59**, 795–797 (June, 1951).

In recent years, there has been a stepped-up demand for ultrafine wire, which has resulted in the con-

CHEMSTEEL CONSTRUCTION COMPANY, INC.
301 Chemsteel Building, Walnut Street, Pittsburgh 32, Pa.
(No "tie-in" with any manufacturer)
Send data on your Design, Engineering, Material, Construction and Maintenance Facilities for
ACID-ALKALI-PROOF CONSTRUCTION
backed by experience serving major steel, chemical, textile and food industries in erection of
PICKLING, PROCESSING & STORAGE TANKS & FLOORING
NAME .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....
TEAR OUT AND MAIL

USE READER SERVICE CARD: INDICATE A 241.



Lasalco's VERTICAL-LIFT FULL AUTOMATIC

Floor Area, Only 74' x 15'

Another production-boosting, profit-making installation by Lasalco:

- Now used for anodizing, the above equipment can be easily arranged for plating by a simple, quick and inexpensive conversion.
- Driving power for the entire machine is hydraulic. The elimination of speed reducers and all excessive mechanism results in much lower maintenance cost.
- Only two operators, to load and unload, can maintain maximum production.
- In plating work using several acid dip tanks, or in anodizing work requiring two or more dye tanks, selective operation is easily arranged to permit either the use or bypassing of one or more tanks.

From all available information, this machine is the fastest producer ever installed in so small a floor space – 74' x 15'.

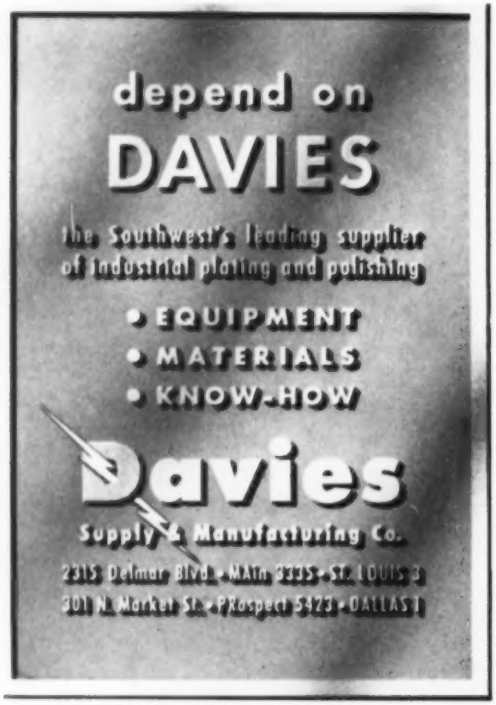
If you want to expand production and reduce operating and unit costs, Lasalco engineers will be happy to give you complete details and discuss your problems without obligation.

Write Today!

Racks shown in illustration are 24" long, 4" wide, 3" thick.

LASALCO, INC.

2818-38 LASALLE STREET • Tel. GRand 2990 • ST. LOUIS 4, MISSOURI


depend on
DAVIES
the Southwest's leading supplier of industrial plating and polishing
• EQUIPMENT
• MATERIALS
• KNOW-HOW
Davies
Supply & Manufacturing Co.
2315 Delmar Blvd. • MAin 2235 • St. LOUIS 3
301 N. Market St. • Prospect 5423 • DALLAS 1

USE READER SERVICE CARD: INDICATE A 243.

Article Abstracts

sideration of new production methods, for example, in miniature tubes and in circuit components (precision resistors). Other possible applications are small thermocouples, and low-inertia, low-volume coils in miniature instruments. The small size of the wire leads to operating features that are quite different from the usual electropolishing process. It is concluded that stainless steel wire, and wire of other metals and alloys, may be reduced in diameter far below the limit possible by conventional wire drawing practices by a readily controllable process of continuous electropolishing. The product's eventual fineness is determined chiefly by wire speed and polishing current, once composition, temperature, and agitation of bath are under control.

Activation of Metal Surfaces Preparatory to Electroplating. N. B. Balashova, Yu. S. Tsareva and A. T. Vagramyan. Doklady Akademii Nauk SSSR 71, No. 1, 73-75 (1950). Transl. No. 2540, Henry Brutcher, Altadena, Calif.

Activation of copper surfaces in potassium cyanide solution and in ethyl alcohol, and of silver surfaces in potassium cyanide solutions but not in ethyl alcohol, was demonstrated by changes in electrode potential and by increases in the number of crystals formed during the early stages of plating. 12 refs.

For 3 Decades

SEELEY'S COMPOUNDS

Foremost in Finishing

For

Buffing . Burring . Polishing

Tumbling Abrasives

•

E. E. SEELEY COMPANY, INC.

Bridgeport, Connecticut

USE READER SERVICE CARD: INDICATE A 244.

DAYBRITE

First in Acid Copper

Let DAYBRITE solve your COPPER PLATING problems. Check these important, money-saving items:

- √ Low Conversion and Operating Costs
- √ High Plating Speed
- √ High Degree Of Leveling
- √ Smooth, Lustrous Deposits
- √ Ideal As Undercoat For Chromium After Color Buff or Brite Dip.

DAYBRITE is time tested and proven. Write now for new technical bulletin giving full details.

DAYTON BRIGHT COPPER CO.

1030 Valley St. Dayton 4, Ohio

USE READER SERVICE CARD: INDICATE A 245.

"CONDUCTA-CORE" LEAD ANODES

. . . Gaining Wide Acceptance in the Plating Industry!

Federated Conducta-Core Lead Anodes . . . designed for decorative or hard chromium plating . . . are high quality products made of prime lead, alloyed under strict metallurgical control.

The highly conductive and non-contaminating 3/8" diameter aluminum rod which runs the full length of the uniquely designed anode assures complete rigidity . . . there is no warping or buckling to interfere with automatic plating operations.

The Conducta-Core Anode's great number of high projections gives greater-than-average throwing power. Its large surface area tends to offset gas polarization . . . anode temperature is kept uniform.

No worry about anodes dropping into the tank because of corroded hooks . . . an improved lead coating 3/16" thick at the base of the copper hook guarantees permanently attached anodes!

Federated Conducta-Core Anodes are made in standard lengths up to 52 inches, with a variety of hooks. Special sizes are available. Flat Rolled and a variety of extruded cross sections can also be supplied.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 246.

SAFETY EQUIPMENT FOR ALL INDUSTRIES

to better serve your
DRUM HANDLING REQUIREMENTS

Write For Literature

IPCO Safety Equipment for all Industries
INDUSTRIAL PRODUCTS COMPANY
2824 N. FOURTH STREET • PHILADELPHIA 33, PA.

USE READER SERVICE CARD; INDICATE A 247.

BEAM-KNODEL CO.

Distributors for
HANSON-
VAN WINKLE-
MUNNING CO.'S

"PLATEMANSHIP"

A Complete Service
for Electroplating,
Polishing and Buffing,
Cleaning and Anodizing

•

195 LAFAYETTE STREET
CA 6-3956-7 New York 12, N. Y.

USE READER SERVICE CARD; INDICATE A 248.

Patent Abstracts

GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,569,577, October 2, 1951. Method of and Apparatus for Electroplating. H. J. Reading, assignor to National Steel Corporation.

I have found that when continuously electroplating strip, and especially at speeds of about 1000 feet per minute or more, the strip drags along the solution that is in contact with the bottom surface at a speed greater than the rate of flow of the solution inwardly toward the middle of the strip. As a result, there is apparently a void or depression formed in the solution at a zone midway of the sides of the strip adjacent the entry end of the cell. It has been found that if all the electrolyte solution which is discharged into the cell below the level of the strip is discharged in the form of a single stream directed upwardly against the bottom surface at the middle of the strip width and adjacent the entry of the cell, the void is filled, and a more uniform coating is obtained, and the middle portion of the surface has a coating of about the same thickness as the edge portions.

CLAIM 1. In apparatus for progressively electroplating only the bottom surface of strip with protective metal while the strip is continuously moving along a path, said apparatus comprising an electroplating cell including open tray means adapted to confine an open bath of electroplating solution, said tray means having an upwardly extending wall at its entry end terminating below the path of the strip, sidewalls at opposite sides of the tray extending above the path of the strip, and wall means at the exit end of the tray means extending above the path of the strip whereby substantially all of the solution circulating through the cell flows rearwardly across the top of the wall at the entry end of the cell in a direction countercurrently

PRICED TO SELL!

MOTOR GENERATORS Reliably Rebuilt 1 Year Guarantee

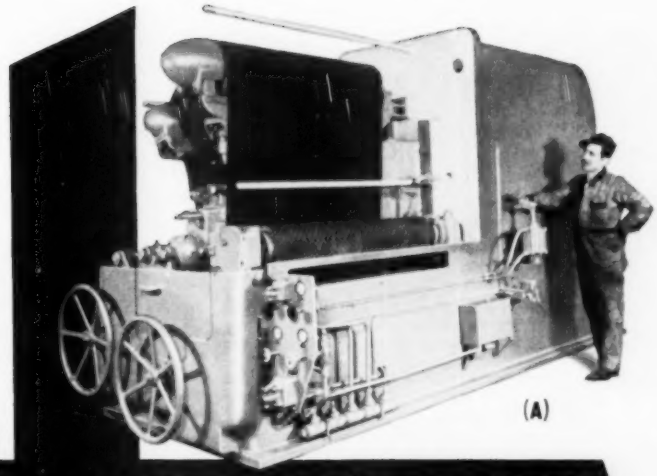
6 12 V.
1—10,000 A. HVW 2½ 10 V.
1—10,000 A. J-L 2½ 10 V.
1— 7500 A. North. 2½ 10 V.
1— 5000 A. HVW 6 12 V.
1— 2500 A. Chandey. 6 12 V.
1— 1500 A. HVW 6 12 V.
1— 800 A. HVW 6 12 V.
1— 600 A. Eager 6 12 V.
1— 500 A. Chandey. 12 V.
1— 300 A. Hobart 6 V.
1— 200 A. Boissier 6 V.
1— 200 A. U. S. 12 V.
1— 150 A. HVW 6 V.
3— 125 A. Hobart 6 V.
1— 120 A. Eager 7½ 15 V.
1— 100 A. HVW 6 V.

15 to 28 V.
1—1000 A. G. E. 15 V.
4— 25 A. Diehl 25 V.
2— 100 A. G. E. 28 V.
1— 200 A. West. 28 V.
1— 500 A. G. E. 28 V.
1— 800 A. G. E. 28 V.
1—1500 A. Cent. 28 V.
1—2500 A. Cent. 28 V.

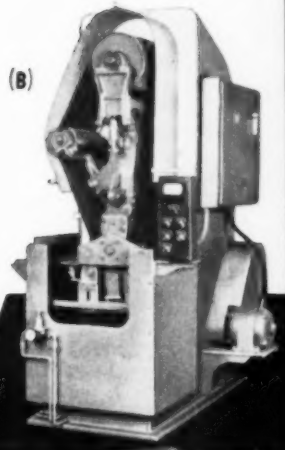
30 to 60 V.
1— 100 A. G. E. 32 V.
1— 200 A. West. 32 V.
1—1000 A. Cent. 32 V.
1—1000 A. Chandey. 40 V.
1—1250 A. Cent. 45 V.
1— 75 A. G. E. 50 V.
1— 325 A. West. 50 V.
1—1500 A. G. E. 50 V.
1—1000 A. G. E. 60 V.
1—1000 A. G. E. 75 V.

L. J. LAND, Incorporated
136 Grand Street, New York 13, N. Y. CAnal 6-6976
Established 1910

USE READER SERVICE CARD; INDICATE A 249.

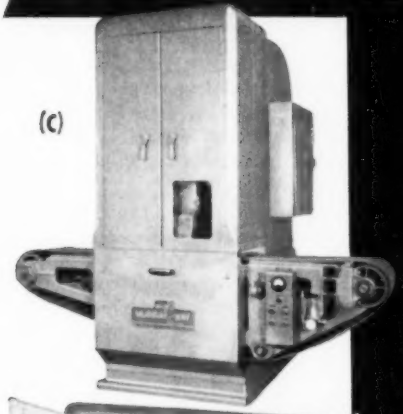


(A)

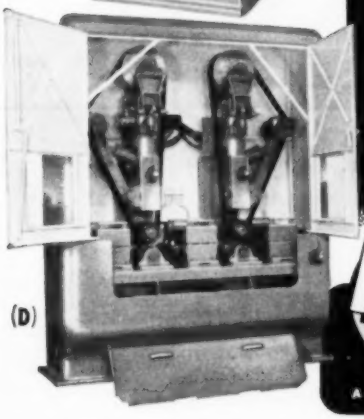


(B)

IF THE STOCK IS FLAT
MICRO-POLISH



(C)



(D)

can automatically finish your job faster, better or cheaper regardless of size, shape or material.

Murray-Way, "engineered-to-the-job", Micro-Polish equipment is now being used the country over in every type of application, on every conceivable kind of material.

Micro-Polish is an amazingly versatile and consistently successful automatic polishing method useful on any job from the prepolishing of low grade steel sheet, to meet high quality job specifications, to the production sharpening and polishing of pruning tools.

Micro-Polish can precision finish any size, shape or length of sheet, strip or blanked stock in ferrous or non-ferrous metals, wood, fiber, plastic, rubber or leather, by wet or dry process.

The typical Micro-Polish equipment shown here demonstrates how Murray-Way engineers have adapted the process to individual job requirements.

A Micro-Polish giant used in reclamation grinding of steel strip.

B One of our smaller units used in polishing narrow bi-metal stock.

C A versatile unit using belt conveyor to polish a variety of flat stampings and forgings.

D A space saver unit for polishing flat bar stock. Two heads and two grades of belt grain accomplish the complete job without rehandling.

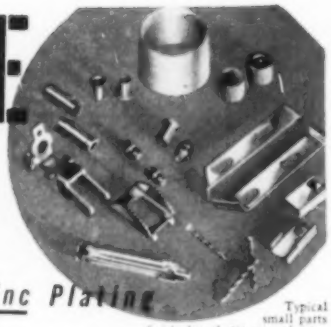
Murray-Way engineers will gladly show you how this time and cost saving method can improve your polishing operation.

MURRAY WAY THE MURRAY-WAY CORPORATION

POST OFFICE BOX 180 — BIRMINGHAM, MICHIGAN

AUTOMATIC POLISHING, BUFFING, GRINDING EQUIPMENT

SAVE TIN



with Tin-Zinc Plating

Typical small parts finished with tin-zinc plating.

Tin-zinc plating — M & T's new plating process — uses 20% less tin than electrotinning; approximately 60% less than hot-dipping.
Yet, the tin-zinc deposit provides unsurpassed corrosion resistance — excellent solderability — a bright, silvery finish when burnished or buffed. Ease of application and economy are additional features.
Tin-zinc plating is applicable to steel, brass, copper and other base metals — affords an outstanding finish for malleable iron castings. It is available for applications where tin is now being used — may also be employed for a number of other essential uses.
Investigate!

Write for Technical Data Sheet No. 107 containing complete, up-to-the-minute information on tin-zinc plating procedure.

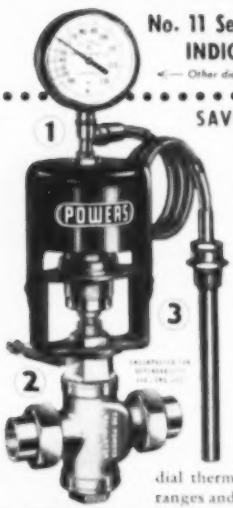
METAL & THERMIT CORPORATION
Specialists in Tin and Tin Chemicals
100 EAST 42nd ST., NEW YORK 17, N. Y.

USE READER SERVICE CARD; INDICATE A 251.

POWERS

No. 11 Self-Acting TEMPERATURE INDICATING REGULATOR

Other dials available



SAVES LABOR—Stops Losses caused by over-heating

Automatically controls temperature of liquids or air at any point desired. Needs no compressed air or electricity for its operation.

3 Plus Values give you more for your money: 1) Easy to read 4" dial thermometer shows temperature of liquid or air being controlled, makes it easy to adjust regulator for proper temperature. 2) Has valve stem lubricator. 3) OVER-heat protection.

Powers No. 11 Regulators are available also without dial thermometer in a variety of 60° F. ranges and valve bodies ¼" thru 8". (110)

ECONOMICAL • DEPENDABLE • SIMPLE • EASY TO INSTALL

▶WRITE FOR BULLETIN 329 • THE POWERS REGULATOR CO.
2779 GREENVIEW AVE., CHICAGO 14, Ill. *Offices in over 50 Cities*

USE READER SERVICE CARD; INDICATE A 252.

Patent Abstracts

to the direction of strip travel; a soluble anode of protective metal in the tray means below the path of the strip; means connecting the anode and the strip to a source of electroplating current as anode and cathode, respectively, means for supporting and horizontally moving the strip forwardly along such path across the tray from the entry end to the exit end with the bottom of the surface in contact with the bath and above the anode at a speed of 1000 feet per minute whereby only the bottom surface is electroplated with anode metal; and means for discharging electroplating solution into said tray and against said strip, said last mentioned means consisting of means including an outlet positioned above the path of the strip arranged to discharge electroplating solution onto the top surface of the strip and consisting of means extending into the tray below the path of the strip and having a single outlet orifice positioned below the path of the strip between the anode and the wall at the entry end of the tray and arranged to discharge a single stream of electroplating solution upwardly against the bottom surface of the strip in a zone at the middle of the width adjacent the entry end of the tray and ahead of the anode.

11 claims, 3 figures.

References cited: U. S. Patents 2,271,736;2,307,928; 2,395,137; 2,399,254. British Patent 986.

No. 2,569,578, October 2, 1951—Apparatus for Electroplating Strip-like Material—E. W. Rieger, assignor to National Steel Corporation.

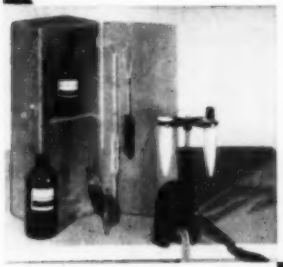
It has been the practice heretofore to allow the electrolyte to flow over the sides of each plating cell and also over the strip entry end as well as over the strip discharge end. Due to the substantial nature of this spillage an extremely high pumping rate has been required in order to maintain a proper amount of the electrolyte in each cell. Where a high circulation rate is required as the result of substantial spillage of electrolyte from each cell, objectionable aeration of the electrolyte is encountered. The aeration of the electrolyte results in the conversion of stannous chloride

A HOT TIP

will usually lose you cold cash. But here's a sure thing if plating's your game: ELECTROPLATING KNOW HOW, the unique training course that betters your results, increases your profits. You'll always win with it! Write Joseph B. Kushner, Electroplating Eng. Stroudsburg lp, Penna.

USE READER SERVICE CARD; INDICATE A 253.

INCREASE YOUR PRODUCTION WITH KOCOUR PLATING TEST EQUIPMENT



All successful platers know that using KOCOUR plating test equipment means better plating, more production, lower costs, increased profits.

● The KOCOUR Sulfate Test Set enables anyone to accurately and quickly determine the sulfate content of a chromium plating bath in order to maintain a constant check on the ratio of sulfates to chromic acid. . . . This is important to insure consistently good plating results. . . . The entire test takes about 7 minutes . . . no calculations are necessary.

● The KOCOUR Chromic Acid Test Set was designed to accurately and simply determine the chromic acid content of chromium solutions. While a hydrometer is sometimes used for this determination, if close control is desired, the solution should be analyzed.

The set is self-contained . . . reads directly . . . is accurate to the one-half ounce per gallon of chromic acid . . . one simple subtraction is the only necessary calculation.

● Many platers use the KOCOUR Set "CR" for determining trivalent chromium in chromium solutions. The importance of this set is that a chromium solution high or low in trivalent chromium is not only expensive to operate but also is the cause of much spoiled work. The set is simple to operate . . . cost of upkeep small . . . no calculations are necessary.

● KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.

Write today for further information—no cost or obligation.

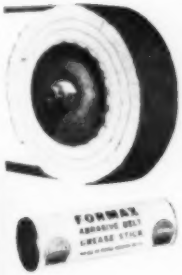
KOCOUR COMPANY
4801 S. ST. LOUIS AVENUE
CHICAGO 32, ILLINOIS

Specify KOCOUR test sets from your supplier.

Your best bet's FORMAX

for
ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth mounted on safe steel centers. Available in a wide range of densities and center diameters.



for
STYLE C-20 CONTACT WHEELS
and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive belt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.

for
BUFFING COMPOUNDS

A complete line of production buffing compounds. Produced in bar and tube form. Formax is the originator of the "Spraymax" Liquid Compounds for brush or spray application.

for
FLEX-A-GLU POLISHING WHEEL CEMENT

—A flexible synthetic adhesive in a ready-to-use form. Dries quickly. Increases polishing wheel life and produces uniform finishes regardless of grit size used.

Send for Descriptive Literature

FORMAX MANUFACTURING CORP
3171 Bellevue Ave. DETROIT 7, MICH.

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning

Oakite's FREE Booklet on Metal Cleaning

answers many questions that mean better production, more profit for you. Just look at the table of contents:

Tank cleaning methods
Electrocleaning steel
Electrocleaning nonferrous metals
Pickling, deoxidizing, bright dipping
Pre-paint treatment in machines
Pre-paint treatment in tanks and by hand
Paint stripping
Machine cleaning methods
Steam-detergent cleaning
Barrel cleaning
Burnishing
Better cleaning in hard-water areas
Treating wash water in paint spray booths
Rust prevention
Machining and grinding

FREE Write for your copy of this 44-page illustrated booklet.

Technical Service Representatives Located in Principal Cities of United States and Canada

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE

OAKITE PRODUCTS, INC.
40 Thames St., New York 6, N. Y.

Send me a copy of your booklet "*Some good things to know about Metal Cleaning*"

NAME .....
COMPANY .....
ADDRESS .....

Patent Abstracts

in the electrolyte to a relatively insoluble stannic chloride. As a consequence a sludge is formed in the plating cells and in the storage tank and recirculating apparatus. Where a high degree of aeration is encountered, a high rate of sludge formation is likewise encountered. Tests have shown that the rate of sludge formation is substantially directly proportional to the pumping rate. . . .

CLAIM 1. In apparatus for progressively electroplating strip, the combination comprising a tank for holding a bath of electroplating solution, means for moving the strip along a horizontal path across the tank from the entry end to the exit end whereby the moving strip drags electroplating solution in the direction of strip travel, means for supplying electroplating solution to the tank, and electroplating anode disposed in said tank below the path of the strip, said tank having a bottom wall, side walls extending upwardly from the bottom wall above the path of the strip across the tank for preventing spillage of electroplating solution across the side walls, an entry wall extending upwardly from the bottom wall toward the path of the strip and terminating below the path of the strip and below the side walls, said tank being free of means preventing the spillage of solution across the top of the entry end wall and said entry end wall forming a discharge weir for the solution at the entrance end of the tank extending upwardly from the bottom wall toward the path of the strip, said strip-moving means comprising a part of strip-engaging rolls including an upper roll and a lower roll adjacent the discharge end of and positioned outside of the tank, one of said rolls being a contact roll for making electrical contact with the strip, means for connecting the contact roll and the anode to a source of electric current, sealing means extending between each of the side walls of the tank and the rolls and sealing means extending between at least one of the rolls and the exit-end wall of the tank, the sealing means with the rolls preventing the spillage of electroplating solution from the exit end of the tank so that substantially all of the spillage of electroplating solution from the tank is across the entry-end

PERIODIC-REVERSE UNITS

Of the Finest Quality for
PLATING
In the Modern Way
Write for Information

UNIT PROCESS ASSEMBLIES, Inc.
75 East 4th St. New York 3, N. Y.

more than
a trade mark...

Sel-Rex
SELENIUM RECTIFIERS

...a symbol of

PRECISION PLATING POWER

The "heart" of the plating plant is the D.C. power supply source. You cannot afford to compromise if you must have uninterrupted production of consistent quality. Sel-Rex equipment is designed by experienced electrical engineers who work closely with your plating engineers to supply the most practical and efficient units that can possibly be built in full compliance with NEMA standards. Our sales engineers have been trained in plating by actually working at plating. This practical knowledge plus engineering background qualifies them as experts in every phase of electroplating procedure and processes.

A staff of well-trained personnel is provided to assist you in conducting an economical and highly efficient plating operation.

You Can Place Your Confidence in Sel-Rex
Manufacturers of the World's Largest Selenium Rectifiers.

A copy of our new catalog "Plating Power" will be mailed if requested on your letterhead. Ask for Catalog #127.

BART-MESSING CORPORATION

NEMA

229 Main Street • Belleville 9, N. J.

Manufacturers and distributors of Plating and Polishing Equipment and Supplies.

IS YOUR PROBLEM
PLATING?

HOLLAND SUGGESTS:

Complete chromium plating unit. Tanks in all sizes.

Contact our technical staff on your metal finishing problems. Write for FREE folder "E" showing our wide selection of metal finishing equipment.

J. HOLLAND & SONS, INC.
MANUFACTURERS • DEALERS
276 SOUTH NINTH ST. • BROOKLYN, N. Y.

USE READER SERVICE CARD: INDICATE A 259.

NEW TYPE VITREOSIL®
(pure fused silica)
ELECTRIC IMMERSION HEATERS
AVAILABLE FROM STOCK

Here is the latest improvement in immersion heaters for heating acid pickling and electroplating solutions, and other acid baths.

Write today for bulletin No. 14 giving specifications and prices

This new VITREOSIL immersion heater features:

- Increased heat transfer per unit area
- Greater resistance to chemical attack
- Molded rubber cap providing efficient sealing and facilitating installation
- Ground wire inside VITREOSIL sheath for additional electrical protection
- Minimum safe immersion depth marked on each heater

THE THERMAL SYNDICATE LTD.
14 BIXLEY HEATH
LYNBROOK, N. Y.

USE READER SERVICE CARD: INDICATE A 260.

Patent Abstracts

wall in a direction countercurrent to the direction of strip movement across the tank and means extending beneath the entry end of the tank for collecting the electroplating solution spilling over the entry wall of the tank.

6 claims, 6 figures.

References cited: U. S. Patents 1,191,386; 1,242,695; 1,484,653; 2,024,248; 2,093,238; 2,271,736; 2,307,928; 2,324,652; 2,344,548; 2,377,550; 2,384,660; 2,490,055. British Patent 467,019. Metal Finishing **42**, 77–79 (February, 1944).

No. 2,570,174, October 2, 1951—Metal Cleaning and Plating Process—Carl F. Weber, assignor to General Electric Company.

CLAIM 2. The method of replating a plated article having thereon a layer of nickel and an outer layer of chromium on said nickel layer, which process comprises immersing the article in a boiling alkaline bath essentially containing sodium silicate, caustic soda and trisodium phosphate, passing a current through said article as the anode at a current density of 75–150 amperes per square foot of anode surface to strip the chromium layer and expose the nickel layer, thereafter immersing said article in a hydrochloric acid bath having a concentration of from 10 to 100 per cent by volume of 21° Bé acid, passing a current through said acid bath with the article as the cathode at a current density of from 75–150 amperes per square foot of cathode surface, and replating the article by applying thereto a flash copper coating, a nickel plate over the flash copper coating and a chromium plate over the nickel plate.

2 claims.

References cited: U. S. Patents 1,863,868; 1,909,149; 2,392,871. J. Electrodepositors' Tech. Soc. **10**, 37–40 (1933–1934). Metal Ind. (London) **64**, 299, 300 (May 12, 1944). Trans. Electrochem. Soc. **88**, 335–337, 346, 347, 354, 358 (1946).

FREE! 61 PAGES OF FACTS FIGURES PHOTOS ON
BARREL FINISHING

These 3 amazing booklets give you the inside story of advanced barrel finishing. Complete facts on sensational new developments in barrel finishing techniques - equipment - compounds.

Write Today For Your FREE Copies
C-2

ALMCO Supersheen
AMERICA'S LARGEST MFGR. OF ADVANCED BARREL FINISHING EQUIPMENT, MATERIALS & COMPOUNDS
ALBERT LEA, MINNESOTA

USE READER SERVICE CARD: INDICATE A 261.

short cut to a better finish . . .

AHCO *Greaseless* COMPOUND

For finishing metals, woods, plastics—AHCO Greaseless Compound saves many polishing operations . . . leads directly to laquering or final buffing *without* cleaning. AHCO Greaseless can be applied to sewed or loose buffs, to leather or string wheels, to provide an abrasive-coated, flexible surface—versatile enough for polishing and cutting down intricate and irregular pieces in one operation. It also eliminates gouging often caused by conventional polishing . . . saves final buffing and coloring time.

AHCO Greaseless is especially suitable for brushed or satin finishes. And it's dry-working: no wet pumice is required. It will pay you to compare the compound you are now using with AHCO Greaseless Compound, both as to performance and price. Write *today* for complete information to the Apothecaries Hall Company, Waterbury 88, Connecticut.

103rd Year

Over a Century of Service

APOTHECARIES HALL CO.

WATERBURY 88 CONN.

AHCO Greaseless Compound is produced under the same rigid laboratory control that has made AHCO Compounds, AHCOLOID Metal Cleaners, and 99% Nucast Nickel Anodes outstanding for uniform high quality wherever finishing is performed.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 262.

Available for Immediate Shipment, Attractive Values

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

PLATERS

1 2500/3750 AMPERE, 6/12 VOLT, **A. P. MUNNING** "OPTIMUS." Separately Excited.

1 6000 AMPERE, 2/6 VOLT, **JANTZ & LEIST.** Separately Excited.

1 6000/8000 AMPERE, 6/12 VOLT, **ROGUE.** Synchronous Motor. Separately Excited.

1 3000/4500 AMPERE, 6/12 VOLT, **EAGER ELECTRIC CO.** Separately Excited.

1 1000/1500 AMPERE, 6/12 VOLT, **HANSON VAN WINKLE MUNNING CO.** Synchronous Motor. Exciter-in-Head.

1 2000/3000 AMPERE, 6/12 VOLT, **HANSON VAN WINKLE MUNNING CO.** Synchronous Motor. Exciter-in-Head.

1 2000/3000 AMPERE, 6/12 VOLT, **A. P. MUNNING** "OPTIMUS."

1 1500/2250 AMPERE, 6/12 VOLT, **HANSON VAN WINKLE MUNNING CO.**

1 1500/2250 AMPERE, 6/12 VOLT, **CHANDEYSSON.** Synchronous Motor. Exciter-in-Head.

1 1000/1500 AMPERE, 6/12 VOLT, **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter-in-Head.

ANODIZERS

1 4000 AMPERE, 40 VOLT, **CHANDEYSSON.** Synchronous Motor, 440/3/60. Exciter-in-Head. Complete Controls.

2 1000 AMPERE, 30 VOLT, **IDEAL.** Exciter-in-Head.

1 1000 AMPERE, 40 VOLT, **CHANDEYSSON ELECTRIC CO.** Synchronous Motor. Exciter-in-Head.

1 500 AMPERE, 40 VOLT, **"M. G. C."** Exciter-in-Head.

1 400 AMPERE, 40 VOLT, **"M. G. C."** Exciter-in-Head.

1 300 AMPERE, 25 VOLT, **CHANDEYSSON** 25 DEGREE. Synchronous Motor. Exciter-in-Head.

RECTIFIERS

1 **GREEN SELECTROPLATER**, 1800 AMPERE, 12 VOLT, for 220/3/60 A.C.

2 **UDYLITE-MALLORY** RECTIFIERS, 1440/720 AMPERE, 6/12 VOLT, for 220/440/3/60 A.C.

1 300 AMPERE, 30 VOLT, **G. E.** COPPER OXIDE RECTIFIER, with separate control 220/3/60.

SPECIAL

2 No. 100 PRODUCTION PIPE POLISHING MACHINES.

Numerous sizes new and practically new Buffing Lathes, popular makes. Prompt delivery without N.P.A. approval.

Many other sizes of M. G. Sets and rectifiers too numerous to mention.

PHONE, WRITE, WIRE

M. E. BAKER CO.

85 WHEELER STREET

Kirkland 7-5460 CAMBRIDGE 38, MASS.

A.E.S. News

New Sustaining Members

Again we have the pleasure of announcing the addition of four companies to the list of sustaining members. They are: Baker Bros., Inc., South Boston, Mass. Beacon Supply Company, Chelsea, Mass. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn. Kyanide Division, Kraft Chemical Company, Chicago, Ill.

Back Issues of The Monthly Review

Mr. E. J. Smith, of Weirton Steel Company, has kindly sent some back issues of THE MONTHLY REVIEW to complement the Society's files for Branch libraries.

Special Delegates Meeting

Plans for the Special Delegates Meeting to be held at the Benjamin Franklin Hotel, Philadelphia, on February 9, have crystallized to the point that a full program has been arranged.

It appears that surprisingly good representation will be had and that the meeting will prove worthwhile.

President Nixon Steps Up

The General Motors Corporation has announced the appointment of A. E. S. President Cleveland F. Nixon as Head of the Electrochemistry Department of the Research Laboratories Division.

Mr. Nixon succeeds Mr. William M. Phillips, an A. E. S. Past President, who will remain with the Laboratories as a Consultant.

Society Representation

Dr. Richard Wick, Bethlehem Steel Company, and Dr. W. A. Wesley, the International Nickel Company, have been appointed to serve on the Inter-Society Corrosion Committee as representatives of the A. E. S. They will keep the membership informed of overall developments in this field so important to almost all platers.

Mr. Walter L. Pinner, Houdaille-Hershey Corporation, and Dr. Walter R. Meyer, Enthone, Inc., have been appointed to represent the Society on the International Committee for Electrodeposition. The object of this organization is to coordinate all activities of member Societies where international action is necessary or desirable. Upon completion of the organization of this committee, in cooperation with the Institute of Metal Finishing, England, a complete report will be made on these pages.

Metal Finishing Report

The Metal Finishing Report of the Anglo-American Council on Productivity may be obtained in limited quantities without charge by directing requests to: Anglo-American Council on Productivity, 2 Park Ave., Room 1219, New York 16, N. Y.

Many who read the condensation of this report in the January issue of PLATING will wish to take advantage of this offer.

Branch News

COMING EVENTS

NEW YORK BRANCH

ANNUAL EDUCATIONAL MEETING AND BANQUET
Statler Hotel
Saturday, February 16

Educational Session at 2:00 P. M.

DR. LOUIS WEISBERG, "Recent Developments in Plating Waste Disposal"

DR. R. B. SALTONSTALL, The Udylite Corporation—Subject to be announced

GUSTAF SODERBERG, Editor, PLATING, "Some Fundamentals of Zinc and Cadmium Plating"

Banquet at 7:00 P. M.

BOSTON BRANCH

SIXTEENTH ANNUAL TECHNICAL SESSION AND BANQUET
Saturday, April 19, 1952
Hotel Statler, Boston, Mass.

Educational Session at 2:00 P. M.

"Modern Industrial Hard Chrome Plating", by ARTHUR W. LOGOZZO, Nutmeg Chrome Corporation, West Hartford, Conn.

"Present Day Decorative Plating", by CLEVELAND F. NIXON, General Motors Corporation, Detroit, Mich., President, American Electroplaters' Society

"Recent Developments in the Disposal of Plating Wastes", by DR. LOUIS WEISBERG, Consulting Engineer, New York City

Banquet at 7:00 P. M.

BALTIMORE-WASHINGTON BRANCH

The December meeting was moved ahead a week to the first Tuesday, December 4, to take advantage of the presence of several foreign visitors to the Symposium of Electrodeposition Researches which was being held in Washington on December 4-6.

The gathering was held at the National Bureau of Standards at 8 P. M. DR. G. E. GARDAM of Great Britain described the present status of plating in his country, and DR. P. BAEYANS of Holland enlightened us about plating practices in the Netherlands. The floor was then opened to discussion, with questions directed to the speakers.

The meeting, although longer than usual, was exceptionally interesting and very well attended.

V. F. HUGHES, JR., *Secretary*

BOSTON BRANCH

On October 4, 1951, MANSON GLOVER (the new third Vice-President of the Metal Finishers Suppliers Association) and LOUIS V. GAGNON reported on the A. E. S. Convention.

DO YOU KNOW ALL THE ADVANTAGES IN USING ROHCO PRODUCTS?

← Check The Information You Desire, Today!

FOR ZINC PLATING

- ☐ ROHCO 100 BARREL ZINC BRIGHTENER for brilliant deposits, maximum coverage and lowest cost.
- ☐ ROHCO 303 STILL ZINC BRIGHTENER for highest lustre zinc, used with or without conversion or bright dips.
- ☐ ROHCO ZINC PURIFIER to keep zinc baths in tiptop shape.
- ☐ NO-FLASH to control foaming and explosions in most plating baths and alkaline cleaners (except chrome).

FOR CADMIUM PLATING

- ☐ ROHCO 20XL (Liquid or Powder) gives brightest cadmium; minimizes cadmium consumption by improving uniformity of deposit.
- ☐ ROHCO 50XL (Powder) for highest production rates of bright cadmium.
- ☐ AIRCRAFT BLACK CADMIUM PROCESS for adherent, attractive blackening of cadmium.

FOR CHROMIUM PLATING

- ☐ ROHCO NO-CRO-MIST controls chrome fumes; solves ventilating and heating problems; saves chromic acid.
- ☐ CHROMETER—a special hydrometer which gives direct chromic acid content at the bath operating temperature.
- ☐ HULL CELLS AND RECTIFIERS for speedy, positive catalyst control.

FOR SILVER PLATING

- ☐ ROHCO Imperial SILVER BRIGHTENER is far more effective than the usual brighteners; gives lustrous, satin finish, increases production up to 2½ times normal.

FOR ALL PLATING

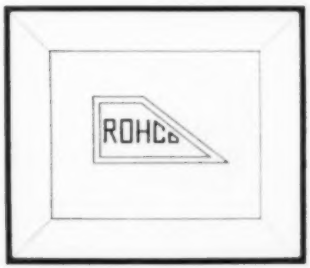
- ☐ ROHCO RINS-AID sheds water; improves drying; prevents staining.
- ☐ COMET RECTIFIER is the newest, most convenient rectifier; dual range 6 and 30 amperes, perfect voltage control, filtered output, automatic timer. Other rectifiers are B-1000 and B-267.
- ☐ HULL CELL UNITS are plating test sets universally accepted for control of plating baths.
- ☐ FORCITE ANODE BASKETS offer the latest and best means for using scrap metal or ball anodes. Two positive, inert, shielded contacts from anode bar to ALL the metal.
- ☐ ADDITION AGENT PUMP feeds any liquid in continuous, small amounts to as many as four plating tanks.

R. O. HULL & COMPANY, Inc.

1302 Parsons Court, Rocky River 16, Ohio

Canada: Armalite Company, Ltd.
Toronto 6, Canada

"YOUR PLATING IS BEST WITH THE HULL CELL TEST"



Branch News

Librarian Horace Nahcos then presented Mr. Henry Straw, Technical Director of MacDermid, Inc., Waterbury, Conn. Dealing with "Cold War Finishes", Mr. Straw discussed zinc as a substitute for nickel and chromium, heavy copper covered by chromium, white brass, yellow brass, tin-zinc as a substitute for cadmium, and finally black oxide finishes. Each was taken up separately, and was followed by a lively question-and-answer period.

The appointment of Louis V. Gregory as sustaining membership chairman and James Anderson as chairman of the Sixteenth Annual Session and Banquet was announced after the meeting had closed.

George P. Swift, *Secretary*

Boston Branch

The Branch met on November 1, 1951, with Vice-President Anderson presiding. It was voted to hold only the Annual Meeting in April, 1952.

A communication from Los Angeles announcing the candidacy of Dick Woolley for Third Vice-President was read. The Branch voted to keep his qualifications in mind; he is much liked here.

Librarian Nahcos introduced Dr. Cuthbertson of the Tin Research Institute of London, England. With "Tin-Nickel Plating" as his topic, he discussed the basic research and general developments to date. The present solution contains a mixture of chlorides and fluorides and is operated at pH 2.5, approx. 25 asf and 150° F. The solution is corrosive, requiring rubber-lined equipment and pure nickel where metal contact occurs, such as in pumps. Continuous filtration with activated carbon and cathode agitation are recommended. Separate tin and nickel anodes must be used, with the tin pulled at all times when current is not flowing. The deposit is brittle and is usually not plated to greater thickness than 0.0003–0.0004 inch. A 165-gal installation is the largest in continuous use to date.

George P. Swift, *Secretary*

Boston Branch

On December 6, 1951, A.E.S. First Vice-President MacStoker's request for information on a correspondence course was read, and no interest was expressed, as was the case in November. A Chicago Branch letter about Branch exhibits was read, and Myer Shapiro, of Gillette Safety Razor Company, was appointed Branch Exhibits Chairman. The names of all members whose dues were not paid were read, and members present volunteered to contact each one.

Librarian Nahcos reported on the Washington Research meeting at the National Bureau of Standards, and then introduced Mr. Edwin C. Rinker, of Bart Laboratories, whose topic was "Electroforming". Mr. Rinker presented an account of plating on both metallic and nonmetallic forms, discussed methods of wiring and racking, pointed to the necessity for extremely large volumes of solution (in comparison to conventional plating practice) and to the much slower plating rates used, such as deposition of copper at approx. 0.0007 inch/hr. Such items as waveguides, mirrors, electronic plumbing, scales, phonograph stampers, and baby dolls were exhibited and discussed. Solution treatment and bath composition were mentioned in a few cases.

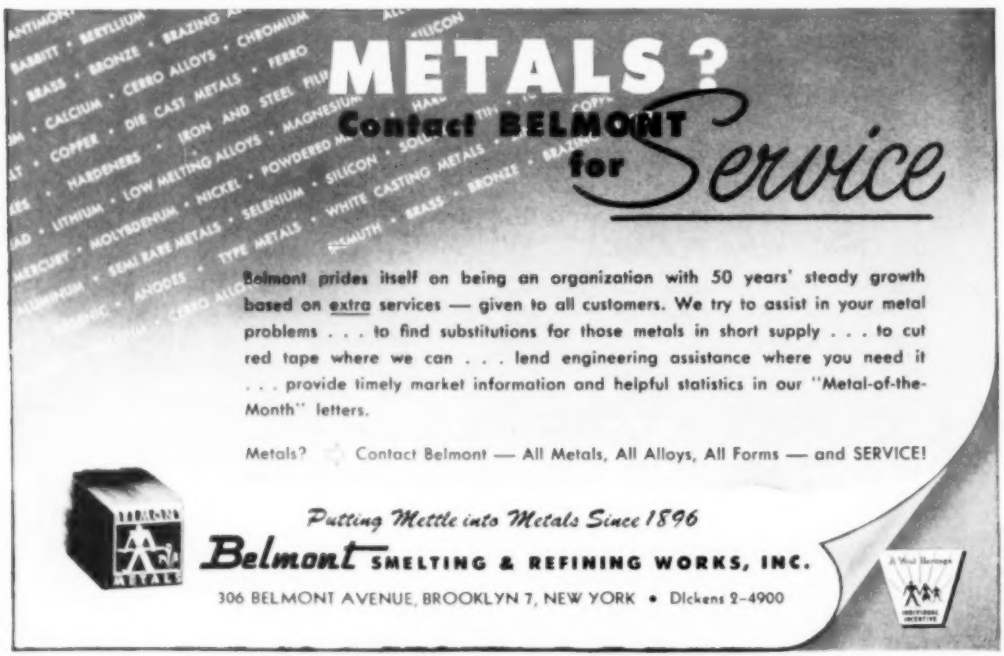
George P. Swift, *Secretary*

Buffalo Branch

The first meeting of the season was held in the Markeen Hotel on September 7. Forty-eight members and guests were present.

The speaker of the evening, introduced by Librarian Dr. A. Janis, was Mr. James A. Bede, President of Bede Products, Inc. Talking about "Principles of Hot Spray Finishing", he pointed to the inconsistent results obtained by the old methods of painting as the room temperature varied. With hot-spraying, at average paint temperatures of 160–180° F, the results are very impressive. Savings as high as 20 per cent have been obtained, with less overspray. Many plants are now adopting this method to obtain deluxe finishes. A very interesting question period followed.

Ben P. Fortin, *Secretary*


METALS?
Contact BELMONT for Service
Belmont prides itself on being an organization with 50 years' steady growth based on extra services — given to all customers. We try to assist in your metal problems . . . to find substitutions for those metals in short supply . . . to cut red tape where we can . . . lend engineering assistance where you need it . . . provide timely market information and helpful statistics in our "Metal-of-the-Month" letters.
Metals? Contact Belmont — All Metals, All Alloys, All Forms — and SERVICE!
Putting Mettle into Metals Since 1896
Belmont SMELTING & REFINING WORKS, INC.
306 BELMONT AVENUE, BROOKLYN 7, NEW YORK • Dickens 2-4900

One Piece Counter-Balanced Safety-Guard — Operates Limit Switch

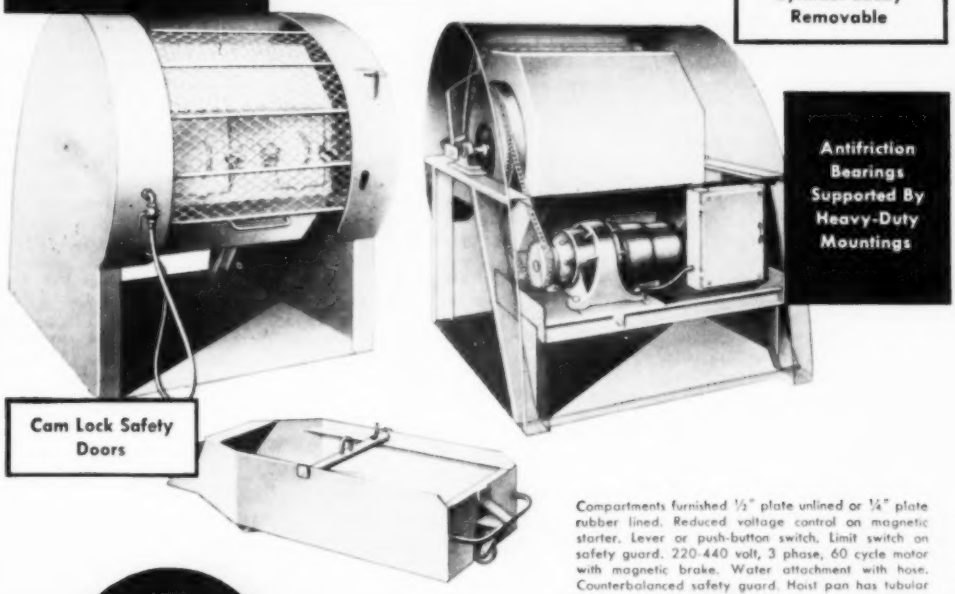
½" Steel Plate Welded Cylinder

Rugged, Welded Steel Frame

Cylinder Easily Removable

Antifriction Bearings Supported By Heavy-Duty Mountings

Cam Lock Safety Doors



Compartments furnished ½" plate unlined or ¼" plate rubber lined. Reduced voltage control on magnetic starter. Lever or push-button switch. Limit switch on safety guard. 220-440 volt, 3 phase, 60 cycle motor with magnetic brake. Water attachment with hose. Counterbalanced safety guard. Hoist pan has tubular yoke with manually operated lock.

TUMBLE GRAV-I-FLO FINISH

ADVANTAGES TO YOU!

31% To 80% More Work-Load in Same Floor Space

15% To 25% Shorter Cutting Cycle

More Work — Less Floor Space

TUMBLING MACHINES

increase direct-labor savings over other tumbling methods

Grav-i-Flo machines have been designed to give you still greater advantages in tumbling. Larger capacity combined with improved cutting materials will slash your processing time tremendously. Plan now to investigate thoroughly how Grav-i-Flo can help you. Our representative will be glad to visit your plant, or you can send samples direct to us for processing.

GRAV-I-FLO OFFERS COMPLETE SUPPLIES AND EQUIPMENT

Look to Grav-i-Flo for all your tumbling needs. Machines available in several models to meet all requirements; hoist pans; separators; wash out doors; screens; chip bins; unloading boots; dip tanks; as well as complete assortment of finishing and deburring chips and compounds for every type and kind of alloy.

THE GRAV-I-FLO CORPORATION

Dept. P-2, 400 Norwood Ave., Sturgis, Michigan

Branch News

CINCINNATI BRANCH

Although Christmas was just around the corner, the Branch had an outstanding turnout for an outstanding meeting on December 19, 1951. After the usual delectable dinner, considerable discussion was devoted to A. E. S. First Vice-President E. J. MacNaughten's letter on the possibility of an A. E. S. Correspondence Course. The majority of those present requested additional information on how the course would be conducted, its cost, who would be eligible to take the course, and the necessity for including some laboratory work. It was the opinion that most would favor such a course in electroplating.

Local members participated in a discussion forum, led by Ray Barry who talked about "Plating Die-Castings", J. F. Daymude who discussed "Alkaline Solution Plating Oxide Coatings", Allen Reed who took "Water Treatment and Sewage Disposal" as his subject and pointed out the necessity for water conservation, Ed Boor who talked on "Plating on Brass", and Ron Winston who concluded with an address on "Plating on Steel". The question-and-answer period proved to be unusually stimulating, so much so that the meeting was one of the longest on record, not adjourning until 10:45, when the members were the guests of the Merchants Chemical Company for the usual Social Hour.

Charles Wise, *Secretary*

DETROIT BRANCH

The Branch held a special technical meeting on Friday evening, November 30, preceding its Annual Christmas Party and Dinner-Dance the night of December 1.

The technical meeting consisted of a symposium on copper plating, presented by Dr. Jesse E. Stareck of United Chromium, Inc., Dr. A. Kenneth Graham of Graham, Crowley & Associates, Inc., Mr. B. C. Case of Hanson-Van Winkle-Munning Company and Mr. W. P. Innes of G. M. C. Research Laboratories. Don Biggs of the Chrysler Corporation acted as chairman. The talks were most interesting to the many Branch members and many out-of-town Societys' representatives present.

The Dinner-Dance proved a huge success, with 1600 guests sitting down to dinner. Tables occupied every room on the immense ballroom floor of the Hotel Statler. The dinner and the excellent floor show which followed was enjoyed by all. Dancing continued until the "wee sma' hours".

The success of this year's Party must largely be credited to the efforts of the committee, under the able chairmanship of Fred Wagner, Walter Pinner and Branch President F. L. Clifton.

E. A. Steegar, *Publicity Chairman*

HARTFORD BRANCH

The usual educational meeting was dispensed with for the month of December. Instead the Branch held its annual Christmas Party and Ladies' Night get-together on the evening of December 4, with over 100 people present at the Nutmegger House in Newington to partake of a delightful hot-buffet dinner (Smorgasbord style) and the usual liquid refreshments.

As an after-dinner speaker, the Branch was fortunate in having the famed explorer and glacialist, Mr. Neil Douglas, present colored movies along with his talk on the "Blue Wrath". The movies showed the discovery of a new glacier, such animal and plant life as eagles, mountain goats and various kinds of flowers, and the breaking off of tons of ice from the glacier, which fell into the sea making a noise that could be heard 10 miles away.

The remainder of the evening was spent dancing to music provided by a disc jockey. Favors were distributed to all through the courtesy of the Bassett Company, Derby, Conn.

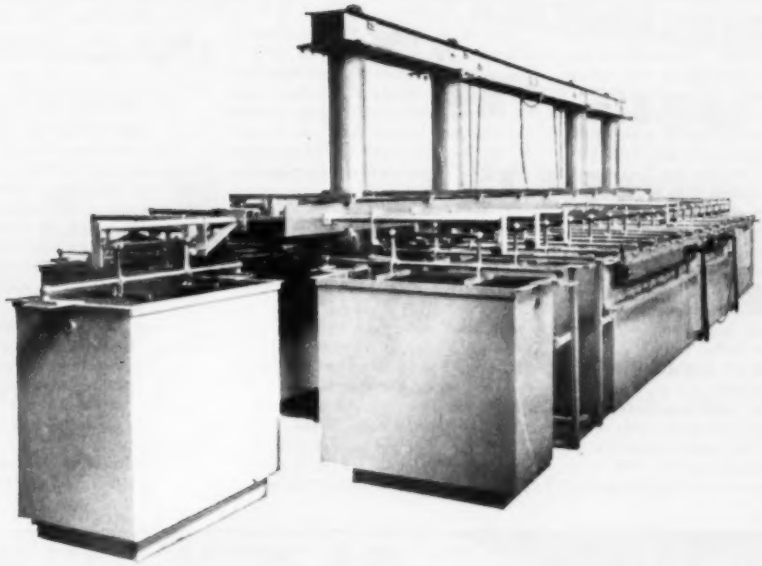
Stanley Platoz, *Secretary*

INDIANAPOLIS BRANCH

Twenty-five were present for a steak

GRIPMASTER
POLISHING WHEEL CEMENT
ANY WAY YOU LOOK AT IT!
PROFIT$ AND PRODUCTION GO UP WHEN YOU'RE A USER OF GRIPMASTER
The simplicity of using GRIPMASTER saves you TIME and SPACE = PROFITS
ACT NOW!
GRIPMASTER DIVISION
Nelson Chemicals Company
12343 Schaefer Highway, Detroit 27, Mich. U.S.A.
Send us a generous FREE sample of GRIPMASTER.
Send data on how to STEP UP polishing production.
COMPANY
ATTENTION
ADDRESS
CITY
IN CANADA: H. C. Nelson Chemicals Ltd., Windsor, Ontario

CROWN TYPE "B" AUTOMATIC



you'll be agreeably surprised . . .

- **At the high production**
- **At the low cost**
- **At the high quality**
- **At the low rejections**

Whether your plating requirements are for high production of small parts or moderate production of large parts, there is a Crown Type "B" machine that will automatically travel your work through the entire treatment cycle — on schedule.

Write us details of your treatment cycle and production requirements for further information

CROWN RHEOSTAT AND SUPPLY COMPANY
3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

INDICATE A 266.

Branch News

dinner and 37 for the meeting on December 5.

The speaker of the evening was one of our own members, Mr. H. Kennedy of the duPont Company. His subject was "Detection and Correction of Impurities of Cyanide Baths". The principal problem with cyanide-copper baths is the removal of zinc, usually caused by diecastings falling into the tank. Inasmuch as zinc removal, with polysulfide, is very laborious, it is advisable that parts be removed daily from the bottom of tanks. Cadmium, silver and tin can be removed by plating out at low current densities. Carbonates above 2-3 oz/gal may be removed by freezing at not less than 26° F. Potassium carbonates may be removed by the addition of barium hydrate or calcium hydrate, the latter being cheaper and better, chromium by the addition of sodium hydrosulfide, organic impurities by plating out or the use of activated carbon.

The following impurities will cause trouble in zinc baths: copper, removed with 1-5 lb/100 gal zinc dust; and cadmium, removed with 1-3 g/gal polysulfide; chromium (from chromate dips), removed with sodium hydrosulfite or by plating out at high current densities, 75 asf. From cadmium solutions, which are generally less sensitive to contamination, copper over 3 g/l may be plated out. Lead and silver will also cause trouble. Carbonates must be frozen out as in zinc.

Edward Brucs,
Secretary

JACKSON-LANSING BRANCH

Up to the closing flicker of the movie, "Curiosity Shop", the December meeting offered much to the members of the Branch.

Mr. A. C. Binning, of the Harshaw Chemical Company, explained some of the amazing features of Fluoborate Plating Solutions. Feats like plating copper at 1000 asf really had the boys wondering what new plating speeds are in store for the industry. The idea of increasing output by merely adding current capacity is intriguing.

At the close of the interesting discussion, President W. H. Mogle called for a rising vote of thanks to Mr. Binning and the Harshaw Chemical Company for the excellent talk and the enjoyable dinner.

Our good Secretary Fred Stuckenburg really enjoyed the dinner the most as, having had his fill of food, he started collecting dues from the members.

Ray Redmond gave us a preview of what is planned for the March Ladies' Nite Party. A grand time is assured.

J. H. Hoefer,
Publicity Chairman

LANCASTER BRANCH

The annual Ladies' Night was held on December 7, 1951, at the Hanover Country Club, when 145 members and guests enjoyed a fine dinner of either roast turkey or lobster tail. During the dinner, Santa Claus distributed gifts to everyone; but he especially favored the ladies. Through the courtesy of suppliers and friends of the Branch, there were numerous prizes for door prizes, bingo and square dancing. Everyone present had an enjoyable and profitable evening.

Harry A. Saylor,
Secretary-Treasurer

LOS ANGELES BRANCH

The December meeting was to have been addressed by First Vice-President Myron Ohnaugh of Bone Engineering Corporation on the subject of "Electroforming". Called out of town on business he arranged for a highly satisfactory substitute, Mr. Silverstone of the Super Matrix Corporation, who is engaged in the same type of work. He gave us an excellent picture of the reasons and applications for electroforming and the methods used, and showed some slides of items which can be manufactured by this means. He included one "wild life" picture for which he had no explanation whatever.

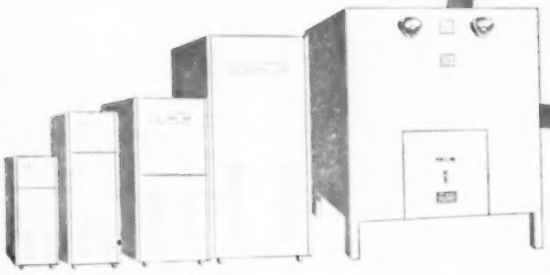
Following a presentation of the history and definition of various processes,

It's New!
FOR METAL FINISHERS
Pressure Molded NEOPRENE "CAPLUGS"
as a Cap
as a Plug
7 STANDARD SIZES
A B C D E F G
TO PLUG HOLE SIZE 1/8-3/16 3/16-1/4 1/4-5/16 5/16-1/2 1/2-5/8 9/16-11/16 5/8-3/4
TO CAP STUD SIZE 3/32-5/32 5/32-3/16 3/16-1/4 1/4-5/16 5/16-3/8 3/8-7/16 5/16-1/2
Masking Problems Our Specialty
DUGGAN
Masking Devices
Send for Literature and Free Sample Kit
2030 WEST FORT ST. DETROIT 16, MICHIGAN

Saves you money every minute you plate

Dependable

RICHARDSON-ALLEN SELENIUM RECTIFIERS



- **FEWER REJECTS**
- **LESS RE-WORK TIME**
- **REDUCED POWER LOSS**

Absolute Minimum Maintenance

Hook up a Dependable Richardson-Allen Selenium Rectifier and, like Tennyson's Brook, it will "go on forever"! Aside from a cooling fan, which requires occasional oiling, there are no moving parts; there are no brushes to replace . . . there is no waste.

SET IT AND FORGET IT!

Richardson-Allen Magnetic controls permit velvet-smooth regulation . . . can be accurately adjusted to the work in the tank and what's more . . . held there!

Richardson-Allen Selenium Rectifiers—**the plater's 100% dependable DC source**—are available for all shops, for all types of plating and for all production methods. They are designed to operate from any commercial AC input. Output from 250 to 10,000 amperes is available in a single cabinet.

WESLEY BLOCK & COMPANY

39-15 MAIN ST., FLUSHING, N. Y.

Richardson-Allen of Canada, Ltd.
370 Victoria Street, Toronto, Ontario, Canada

DEPENDABLE POWER FOR EVERY DC NEED

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 270.

be pointed out that some parts cannot be manufactured by any other means because of their shape and the finish required, particularly on interior surfaces. Some cannot be manufactured economically in any other way, because of the odd conformation characteristics involved. The lost-wax casting methods are, in many cases, not applicable because of the tolerances required. Virtually any material can be used as a starting core: metal, wood, plaster, wax, etc. The solutions used for copper, nickel, iron and silver baths, together with the nominal composition to produce desired results were listed. Certain refinements, such as purification, filtration and cleanliness, must be carried to the extreme.

Mr. Silverstone had an interesting display of electroformed parts, which included phonograph records, aircraft parts, plastisol molds, and radar parts. The thorough discussion of his paper indicated the active interest which it aroused.

There was one application for membership, and 4 applicants were elected. JOHN MILLHORN was appointed General Chairman of the Annual Technical Session and Dinner-Dance to be held in March, 1952.

G. STUART KRENTEL, *Secretary*

NEWARK BRANCH

Fifty members and guests attended the regular monthly meeting on November 16, when 5 new members, one in-transfer and one new membership application were received.

After HOWARD COHN had shown a 3-reel sound movie, "Drama of Steel Making", released by the U. S. Bureau of Mines, LIBRARIAN ROBERT HORROCKS introduced MR. W. CERESA, of Westinghouse Electric Corporation. Speaking on the subject, "Substitute Finishes for Decorative Applications", Mr. Ceresa showed slides of the types of finishes used and gave minimum thickness requirements. He stressed the advantages of PR copper plating over conventional cyanide copper plating where little or no nickel is used under the chromium. Salt-spray tests show PR copper-chromium to compare favorably with the usual copper-nickel-chromium system. The bath contains 7–9 oz/gal copper, 0.8–1.5 oz/gal free KCN, 4–6 oz/gal KOH, 0.5–1 oz/gal Wes 1-X, and is operated with PR current, agitation and diaphragmed copper anodes at 100+ asf and 170–190° F. The speaker answered a number of questions during the discussion period that followed the interesting talk.

Bottled beer was then served, courtesy MR. JOHN BANTA, Oakite Products, Inc.

SAMUEL S. FREY, *Recording Secretary*

PITTSBURGH BRANCH

The fact that eight inches of snow had just covered the area and that roads were in a precarious driving condition did not reduce the holiday spirit of the 60 merrymakers who gathered at the Annual Christmas Party on December 15. Continuous entertainment was had during the entire evening, and FAYE PARKER, well-known radio star, did a wonderful job in giving the party a Christmas air. Refreshments were served throughout the evening.

G. D. WOODRUFF and his committee deserve a vote of thanks for organizing this very successful affair. If the temperature had not been in the vicinity of zero, we are quite certain that the crowd would have been increased fourfold. Perhaps the weatherman will be a little more generous next year.

R. H. SCHINDLER, *Secretary*

PROVIDENCE-ATTLEBORO BRANCH

More than 50 members and guests turned out on November 19 to hear DR. HENRY KELLNER, Lea Mfg. Company, discuss "Bright Copper Plating".

After enumerating the characteristics desired of a bright-copper plating solution, such as high throwing power, wide bright range and ease of control, Dr. Kellner described how the available cyanide solutions meet these criteria. The development of bright coppers is following in the footsteps of bright nickel. First, the platers had to learn to use all the control methods; and then the complicated bright baths were simplified to allow considerable freedom of operation, provided certain basic preparatory conditions were strictly followed.

The question period was quite lengthy, demonstrating the great need for a truly bright copper, not only in its own right but as a substitute for the more scarce nickel.

Stop costly shutdowns with BLAKESLEE metal parts washers
Niagara Metal Parts Washers furnish the most dependable continuous operation. Consistent performance plus efficient cleaning keeps subsequent finishing lines going. For continuous and batch type metal parts washers you can put your confidence in a Blakeslee engineered product designed for your specific needs.
Write today for full information
G. S. BLAKESLEE & CO.
CHICAGO • NEW YORK • TORONTO
BLACOSOLV the highest stabilized degreasing solvent
1844 So. 52nd Ave. CHICAGO 50, ILL.
SOLVENT VAPOR DEGREASERS in standard or special conveyor models
NIAGARA-METAL PARTS WASHERS—built to fit your needs
CANADA
G. S. BLAKESLEE & CO., LTD.
1379 Bloor St., W.
TORONTO 9, ONTARIO
FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A 271.

During the short business session, plans were discussed for the Christmas Party at Johnson's Hummocks, on December 10.

EDWARD A. PARKER, *Secretary*

ROCHESTER BRANCH

One applicant was elected to membership on November 19.

The final arrangements were made for the annual Branch Christmas party at the Liederkrantz Club.

During the educational portion of the meeting, MR. JOSEPH HARTLY, of the Norton Company, discussed interestingly the use of abrasives in barrel finishing, as well as barrel finishing in general.

CHARLES B. FINEOR, *Secretary*

ST. JOSEPH VALLEY BRANCH

At the regular monthly meeting on December 12, 1951, 29 members were present at the dinner and 36 attended the technical session. There was election to membership and three membership applications.

PRESIDENT DR. ERNEST WILHELM introduced the guest speaker, MR. HERBERTH E. HEAD of Briggs Manufacturing Company, Detroit. Mr. Head's paper, "Chromic Acid Anodizing and Its Practical Use", was published in the January, 1952, issue of PLATING.

A lively question-and-answer period followed, which among other topics dealt with insulation for temperature-controller bulbs; rack construction and rack insulation; stop-off in anodizing assemblies including steel and magnesium; color of anodizing films; current-density variations, current interruptions in anodizing; use of ionized water to increase salt-spray resistance; close-tolerance temperature-control instruments; methods of increasing current from 0 to 40 volt and transferring work from one tank to another in automatic anodizing equipment. Mr. Head's paper and his answer to questions were extremely interesting, and the Branch appreciates his very excellent and timely presentation.

EUGENE ROTH, *Secretary-Treasurer*

SYRACUSE BRANCH

On December 10, the Branch held its third annual Christmas party at Aureli's Restaurant, Liverpool, N. Y. An excellent dinner was served 160 members and guests from the St. Louis, Buffalo, Rochester and Waterbury Branches. PRESIDENT HENRY C. HOLBERT introduced the out-of-town guests.

There were numerous door prizes from suppliers and platers. Oneida Limited, of Oneida, N. Y., provided sterling-silver lapel pins for all the ladies.

KENNETH PARNELL, Chairman, his Co-chairman, WILLARD PHILIPS and ARTHUR G. MARTINEAU, Sr., and the many co-operating members are to be congratulated on the outstanding attendance record of this party.

The officers of the Syracuse Branch wish all members and friends a most prosperous and happy New Year.

LINDLEY S. WOOD, *Secretary*

TORONTO BRANCH

The guest speaker on November 9 was DR. R. B. SALTONSTALL, of The Udylite Corporation, whose subject was "Trends in the Electroplating Industry Today". Saltonstall is an old friend of the Toronto Branch; this was the third time he has addressed the Branch.

His talk was very interesting to us as Canadians, because it gave us an insight into what is being done in the United States in the way of substitute finishes. As far as shortages go, we are probably not quite so badly off as our American friends; however matters here are heading in that direction, and although substitute finishes have not yet been found necessary in most cases, they may have to be used in the future.

A very lively discussion followed, and then a short business meeting.

BENNY CAMERON reported the final arrangements for our Annual Dance on November 29, that promises to be one of the highlights of the year for Toronto platers and their friends.

KERGEN WELLS reported on the progress of the Research Finance Committee; we are happy to know that the Canadian project, No. 14, on "Elimination of Impurities in Plating Solutions" is now underway.

A. L. COXHEAD, *Correspondent*

WATERBURY BRANCH

Through PRESIDENT E. W. COUCH, the Branch members at the meeting on November 9, 1951, were able to see a new movie, "A Way of Living", filmed locally

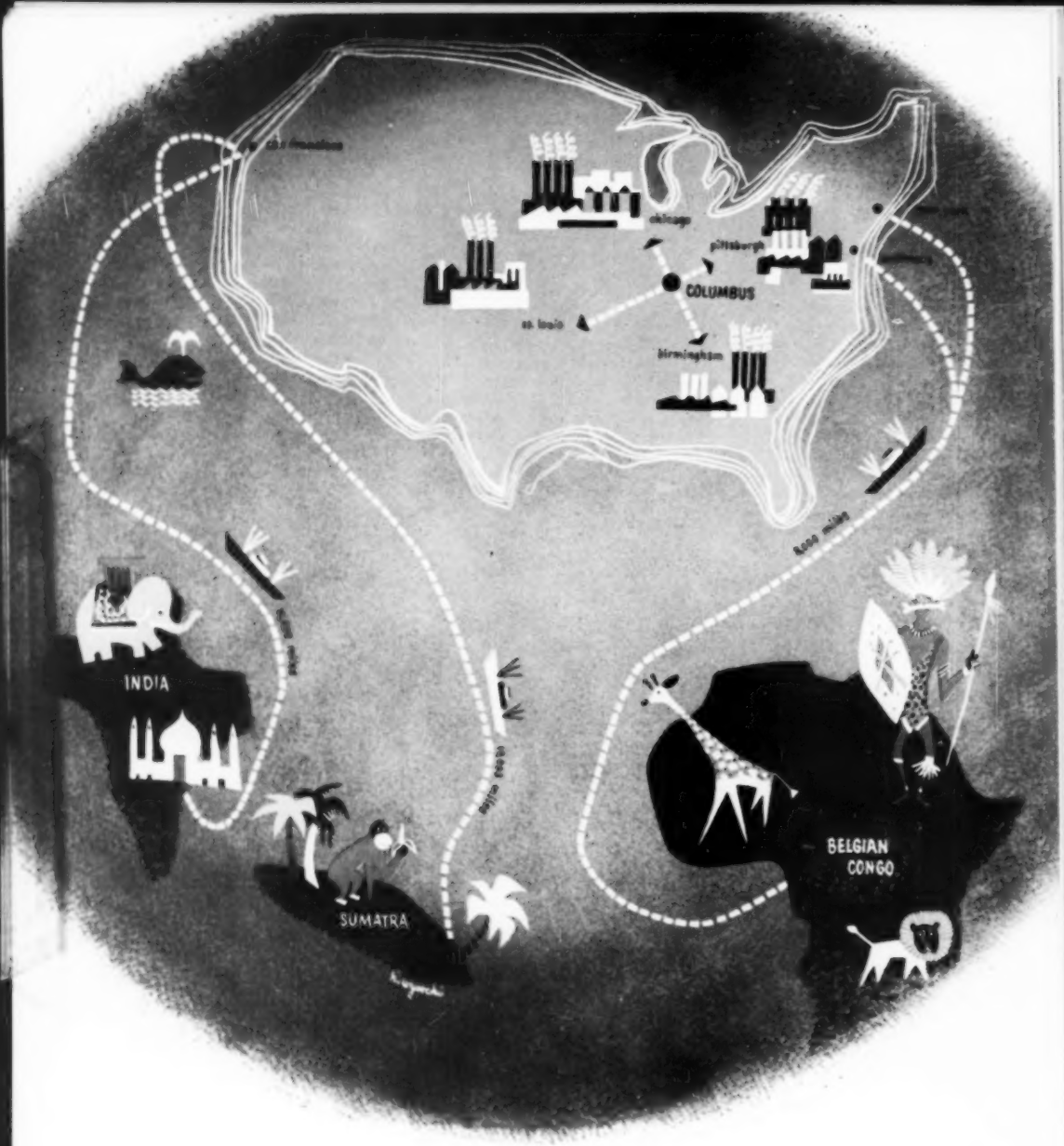
NO
SALES CLAIMS
CAN SELL
THESE
BRIGHTENERS

as well as a trial in your own plant!

Write today for a specially priced trial order of the ARP Brighteners for any zinc or cadmium plating solution. Or see your Iridite Representative.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

Manufacturers of Iridite Finishes
for Corrosion Resistance and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals.



Not half a world away . . . but right in the heart of the industry

The map tells the story. Contrast the complications in obtaining palm oil from foreign-controlled sources with the reassuring ease of getting its new domestic replacement, *Palmoshield*. For the imported product: harvesting, extracting, refining, transporting to port, loading on tanker, shipping 8000 miles or more to U.S., unloading for tank storage, reheating and reloading for shipment to customers. For domestic *Palmoshield* a call to Ironsides in centrally located Columbus brings immediate shipment with delivery in no way dependent on uncertain world conditions.

New All-American Lubricant for Cold Rolling Operations

FROM The Ironsides Company of Columbus, Ohio, comes another important contribution to the American steel industry.

It is Palmoshield, the first workable replacement for imported palm oil . . . a 100% domestic product which frees U. S. tin plate producers from dependence on foreign sources for the essential lubricant in rolling operations.

All-American Palmoshield duplicates every chemical characteristic of the imported oil. It looks like palm oil, feels like palm oil, acts like palm oil, handles like palm oil and requires absolutely no changes in rolling mill operation. It is superior to palm oil in that it is subject to exact chemical control.

Tested for three years in actual rolling mill operation

Palmoshield has been under continuous testing for the past three years in cold rolling steel production under standard operating conditions.

Rolling characteristics are equal to palm oil. The cleaning operation is above average. Annealing and temper rolling are up to standard in every way. Tinning, both hot dip and electrolytic, yields a most satisfactory product. During this testing, the new Ironsides lubricant was reclaimed with good results both as to yield and product.

Tests prove four advantages over imported palm oil

1. *Palmoshield is widely available in this country. Users are not dependent on shipping during unsettled world conditions.*
2. *The domestic materials which go into Palmoshield are so freely available as to supply all steel production of the United States without "borrowing" from other defense requirements.*
3. *Due to its availability, Palmoshield need not be stockpiled. However, there is no deterioration from extended storage.*
4. *Palmoshield is subject to exact chemical control. The free fatty acid content does not vary from batch to batch and can be specified by the user.*

Palmoshield now in commercial production

With testing completed and production on a commercial basis, Palmoshield is now available for immediate shipment to steel companies in 55-gallon drums and in tank car lots. It is competitively priced. For complete details call or write The Ironsides Company, 270 West Mound Street, Columbus, Ohio. Upon request, the Ironsides representative in your area will call and give you full information in person.

Tough lubrication problem? Call on Ironsides first!

Palmoshield is by no means an "out-of-the-blue" discovery. It is a product of years of research prompted by the fact that World War II emphasized a definite threat to American steel producers dependent on overseas sources. More than that, it is backed by Ironsides' sixty years of specializing solely in the field of scientific lubrication.

Many steel men are familiar with other Ironsides "firsts," among them wax base drawing lubricants, aircraft cable lubricants, electro-deposition of drawing lubricants, outboard motor lubricants and stabilized non-ferrous wire drawing lubricants. It's significant that in any field it is the specialist who comes up first with the right answer to the tough problems. If yours is lubrication, consult the specialist—call on Ironsides first.

SPECIAL LUBRICANTS and PRESERVATIVES

IRONSIDES SHIELD PRODUCTS **PALMOSHIELD**

For Quality and Uniformity
Specify

HARRISON 4A PRODUCTS

Stainless Steel Buffing & Polishing Compounds
Faster Cutting—Increased Production—Economy

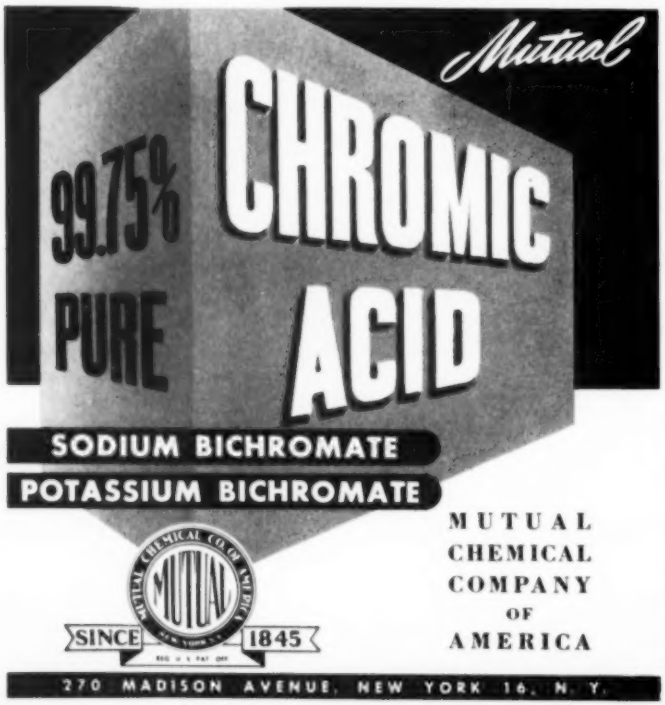
Glazing Compounds
Compounds for Spraying or Dipping

Use 4A Cement and Thinner—For Setting Up Wheels, Belts, Rolls, etc.—Longer Life—Greater Production

Consult Us On Any of Your Problems
We'll Gladly Advise and Send Samples

HARRISON CO., INC.
HAVERHILL, MASS.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 274.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 275.

with members of the Waterbury Kiwanis Club as participants and produced by Audio Productions, Inc. To be shown throughout the world in an effort to depict the American way of life, it illustrates how a service club works in a community to make it a better place to live. In the picture, a program for aiding high-school youths in selecting proper careers grows from a talk given by a high-school boy in which he tells of the problems facing young people starting out to earn a living. The movie is well done, intensely interesting, and should give our doubting neighbors a glimpse of our normal way of doing things.

Since government defense requirements have been making plating supplies critical BILL STARR has given a resumé of the situation each month, unfortunately showing an increasingly worsening picture, with metal cyanides in very poor supply and nickel difficult to obtain even for permitted uses. We plan to continue this service as long as the supply situation demands it.

DR. GEORGE DUBPERNELL tied the book review to the speaker's subject. "Ion Exchange, Theory and Application", edited by Frederick C. Nachod, is an outstanding book and one of the first on ion exchange. Each chapter is authored by a different expert, and although much of the book is highly theoretical, there are several practical chapters which are valuable to platers.

MR. JAMES STANTON, Eastern Manager of the Illinois Water Treatment Company, however, explained quite clearly and practically several applications of ion exchange of real interest to platers. Speaking on the subject, "Application of the Ion Exchange Principle to the Purification of Chromic Acid Solutions and the Use of De-ionized Rinse Water in the Plating Industry", Mr. Stanton discussed how chromic acid plating and anodizing solutions can be freed of such metallic contaminants as iron, copper and zinc. By adjustment of concentration to prevent decomposition and by the proper selection of resin, chromic acid can be recovered at a cost which in many cases should justify the installation. Although some special local applications of ion exchangers are being made to improve rinse water, the water in this area is usually of sufficient purity to cause little trouble in plating. However, in much of the country, hard water often should be treated for rinsing and particularly for plating-bath makeup.

According to a conclusion reached at the last business meeting, October 24, it was voted that the President appoint a nominating committee in February, which will present its nominations at the March meeting. Final nominations, election and installation of officers and delegates will be made at the regular April meeting.

SPENCER L. HENN, *Secretary*

Membership Report of the A. E. S.

Elections

BALTIMORE-WASHINGTON: J. B. Houck, Jr., M. L. Kronenberg
BOSTON: H. F. Campbell, J. F. Flores, E. B. Murphy, P. Sutherland, A. Wasilco
CHICAGO: H. Hart, C. B. Ross
GRAND RAPIDS: O. D. Hoxie, J. W. Kaines, F. M. King, T. Lucas, C. L. Malone, A. Preston, F. Preston, A. L. Phillips, G. Quist, P. L. VadeBoncoeur
HAMILTON: R. Burke, D. McLeod, R. V. Rosas
MILWAUKEE: P. C. Franson, R. R. Seeber
MONTREAL: W. O. Charbonneau
NEWARK: A. K. Althouse, Jr., R. Edwards, E. F. Foley, Jr., H. J. Gorman, A. J. Werner
NEW YORK: V. Serpa, J. Sybalsky
ST. JOSEPH VALLEY: J. E. Mokman
SOUTHEASTERN: B. R. Smith, F. E. Stillwell
SPRINGFIELD: J. C. Greenan, E. McCarthy
SYRACUSE: G. A. Brost, H. Miller
MEMBERSHIP-AT-LARGE: C. N. Green, L. J. M. Teepe, H. L. Turner

Reinstatements

CHICAGO: Irene Donnelly
LOS ANGELES: C. Green, E. Price
PITTSBURGH: E. T. Busch, W. H. Rolshouse
SPRINGFIELD: A. A. Copp
MEMBERSHIP-AT-LARGE: A. K. Chatterjee

Transfers

L. M. Guilford from Boston; J. T. Wenckus from Boston; J. A. Jacks to Detroit, L. J. Howald to Detroit; T. R. Williams from Detroit; P. B. Croley from Detroit; B. C. Case to Newark

Resignations

BOSTON: J. Powell
GRAND RAPIDS: P. Roberts, D. Peacock
LOS ANGELES: C. Weber
NEW YORK: I. Goldman
PROVIDENCE-ATTLEBORO: R. W. Cummings previously reported resignation in error

Suspensions

BOSTON: E. P. Carter, K. R. Corson, J. W. Coulouris, M. S. Glock, S. J. Goodman, W. M. Hague, Jr., T. V. Keating, Jr., M. Kraff, H. J. Lack, M. G. Mutchler, O. F. Pearson, E. M. Pfingston, L. F. Pope, L. J. Reczek, R. L. Smith, R. H. Stalbaum, F. Sullivan, H. J. Wenham, M. J. Zopatti
GRAND RAPIDS: P. W. Goodspeed, D. Miles, V. Ventolo
HAMILTON: G. M. Dalton, H. A. Deem, J. DiCiccio, C. O. Connor, F. Thomas, N. Woodruff
LOS ANGELES: G. Bishop, J. Hamor
NEW YORK: J. Sirota

Deaths

SAN FRANCISCO: L. A. Delamothe

Membership Competition

BRANCH	Membership Apr. 1, 1951*	New Members	Net Change in Membership	Per Cent Net Change
First Group				
Melbourne	126	36	+30	+23.8
Chicago	409	44	+41½	+10.1
New York	279	23	+22	+ 7.5
Hartford	137	9	+ 6	+ 4.4
Waterbury	126	4	+ 2	+ 1.6
Milwaukee	143	11	+ 2	+ 1.4
Cleveland	205	19	+ 2½	+ 1.2
Bridgeport	152	9	+ 1½	+ 1.0
Newark	239	13	+ ½	+ 0.2
Detroit	492	28	− 9½	− 1.9
Grand Rapids†	164	11	− 6½	− 4.0
Philadelphia	201	11	− 8	− 4.0
Los Angeles	211	11	− 9	− 4.3
Pittsburgh	132	5	− 8	− 6.1
Boston	151	12	−10	− 6.6
Second Group				
Rockford	67	10	+10½	+15.7
Buffalo	85	14	+13	+15.3
Indianapolis	92	8	+10	+10.9
Syracuse	85	12	+ 6	+ 7.1
Toronto	121	9	+ 8	+ 6.6
Baltimore-Washington	87	7	+ 4	+ 4.6
Rochester	88	9	+ 2½	+ 2.8
Providence-Attleboro	100	1	+ ½	+ 0.5
Dayton	82	2		
Cincinnati	88	4	− ½	− 0.6
St. Louis	105	3	− 3	− 2.9
St. Joseph Valley	74	4	− 2½	− 3.5
Sydney	93	3	− 6	− 6.5
Montreal‡	77	5	− 7	− 9.1
New Haven	108	3	−19	−17.6
Third Group				
Dallas-Fort Worth	31	14	+13½	+43.5
Houston	25	8	+ 9	+36.0
Saginaw Valley	57	15	+ 8½	+14.9
Jackson-Lansing	52	5	+ 3½	+ 6.7
Lancaster	60	5	+ 4	+ 6.7
Louisville	23	1	+ 1	+ 4.4
San Francisco	65	5		
Allentown-Reading§	42	2	− ½	− 1.2
Southeastern	48	5	− 1	− 2.1
Twin City	66	1	− 2½	− 3.8
Springfield	54	4	− 4	− 7.2
Toledo	45		− 4	− 8.9
Adelaide	65	5	− 7	−10.8
Hamilton	25	3	− 3	−12.0
Columbus	54	2	− 7	−13.0
Western Ontario	23	5	− 5	−21.7
Outside Competition				
At Large	120	15	− 2	
In Transfer	16		+11	
Total A. E. S.	5,387	450	+85	+ 1.6
Active Membership, January 1, 1952			5,472	

*Subject to correction. †, ‡, §Winners in first, second and third group, respectively, of 1950–1951 membership competition.

SUSTAINING MEMBERSHIP LIST

As of January 15, 1952

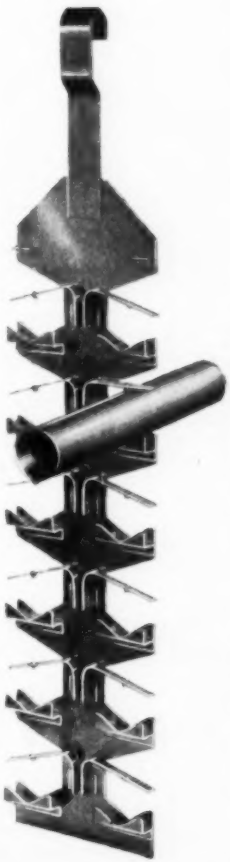
(Figures in parenthesis indicate number of memberships held)

Accurate Electro-Plating, Inc
Accurate Engineering Laboratories
Acme Plating Company, The
Acme Steel Company
Adolph Plating, Inc
Advance Plating Company, The
Aetna Electroplating Company
Allen-Bradley Company
Allied Industrial Products, Inc
Allied Research Products, Inc
Alsop Engineering Corporation
Aluminum Company of America
American Buff Company
American Cabinet Hardware Corporation
American Can Company
American Chemical Paint Company
American Fixture & Manufacturing Company
American Flange & Manufacturing Company
American Hot Dip Galvanizers Association, Inc.
American Instrument Company
American Nickeloid Company
American Radiator & Standard Sanitary Corporation
American Smelting & Refining Company
American Wire Fabrics Corporation
American Zinc Institute (5)
Apex Plating Company
Apollo Metal Works
Apothecaries Hall Company
Ardco, Incorporated
Armco Steel Corporation
Arrow-Hart & Hegeman Electric Company
Arrow Plating Company, Inc
Arvin Industries, Inc
Auto City Plating Company
Autoyre Company, Inc
Automotive Rubber Company
M. E. Baker Company
Baker Bros., Inc.
Bastian-Blessing Company, The
Beacon Supply Company
Belke Manufacturing Company
Bell Telephone Laboratories, Inc
Bendix Products Division, Bendix Aviation Corporation
Bertsch-Lowell Plating Works
Bethlehem Steel Company (2)
Blakeslee, G. S. & Company
Briggs Manufacturing Company
Brookline Electro Platers, Inc
Bruce Products Corporation
Buckeye Products Company, The
Buckingham Products Company (2)
Chase Brass & Copper Company
Chemical Corporation, The
Chicago Electro-Platers Institute
Chicago Roller Skate Company
Chicago Thrift-Etching Corporation
Christie Plating Company
Chrome-Rite Company (2)
Chromium Corporation of America
Chromium Process Company, The
Chrysler Corporation (2)
Cinch Manufacturing Corporation
Clayton Mark & Company
Cleveland Graphite Bronze Company, The
Clinton Company, The
Clinton Supply Company, Inc.
Codman, F. L. & J. C., Company
Corona Corporation
Cowles Chemical Company
Crane Company
Croname, Incorporated
Crown City Plating Company
Crown Cork & Seal Company
Crown Rheostat & Supply Company
Durco Dept., Atlas Powder Company
Davies Supply & Manufacturing Company
Daystrom Corporation
Detroit Plating Industries
Diamond Alkali Company
Diversey Corporation, The
Dixie Electro Plating Company
Doehler-Jarvis Corporation (2)
R. R. Donnelley & Sons Company
E. I. duPont de Nemours & Company
Dura Div., Detroit Harvester Company
Dura-Chrome of Chicago, Inc.
Eastman Kodak Company (2)
Eaton Manufacturing Company
Eleco Products Company
Electric Auto-Lite Company, The (2)
Electro Coatings, Inc.
Electrolux Corporation
Ellmore Silver Company, The
Enthone, Inc.
Erie Plating Company
Felt & Tarrant Manufacturing Company
Finishing Publications, Inc.
Ford Motor Company (5)
Formax Manufacturing Company
Fox Products Company
Frigidaire Division, General Motors Corporation
Gemex Company
General Electric Company
General Motors Corporation (5)
Gerity-Michigan Corporation
Gorham Manufacturing Company
Graham, Crowley & Associates, Inc.
Graham Plating Works
Grand Plating Company
Great Lakes Plating Division
Frederick Gumm Chemical Company
C. Hager & Sons Hinge Manufacturing Company
Hall-Mack Company
Hamilton Watch Company
Hammond Machinery Builders, Inc.
Hansen-Van Winkle-Munning Co. (3)
Harding Manufacturing Company
Hardwood Line Manufacturing Company
Harshaw Chemical Company, The (3)
Haviland Products Company
Heil Process Equipment Corporation
Heywood-Wakefield Company
Houdaille-Hershey Corporation (3)
Howard Plating Industries, Inc.
Howell Company, The
Hub Plating Works
Hudson Motor Car Company
R. O. Hull & Company, Inc.
Hy-Grade Electroplating Company
Illinois Watch Case Company
Industrial Filter & Pump Manufacturing Company
International Business Machines Corporation
International Nickel Co., Inc., The (5)
International Silver Company
Jones & Laughlin Steel Corporation
Kaynide Div., Kraft Chemical Co.
Keeler Brass Company
Kelite Products, Inc.
Kelly Plating Company, The
Knape & Vogt Manufacturing Company
Knight-Morley Corporation
Knight Plating Company
Koppar Company
Kohler Company
Kuehne Manufacturing Company
Lasalex, Inc.
Lea Manufacturing Company, The
Leeds & Northrup Company
Chas. F. L'Hommedieu & Sons Company
A. J. Lynch & Company
Lyon, Incorporated
Maas & Waldstein Company
W. D. MacDermid Chemical Company
MacDermid, Incorporated
Magnuson Products Corporation
R. C. Mahoney
P. R. Mallory & Company, Inc.
Manderscheid Company, The
Matchless Metal Polish Company, The
Mattatuck Manufacturing Company
Maurer Supply Company
McGean Chemical Company, The
Meaker Company, The
Mechanical Plating Company
Mercil Plating Equipment Company
B. Mercil & Sons Plating Company
Metal Mouldings Corporation
Metal Processing Company
Michigan Bumper Corporation
Michigan Chrome & Chemical Company
Midwest Chrome Process Company
J. C. Miller Company
Minneapolis-Honeywell Regulator Co.
Mitchell-Bradford Chemical Co., The
Modern Plating Company
Modern Plating Company, The
Modern Plating Corporation
Moore Drop Forging Company

Motor Products Corporation
Mutual Chemical Company of America
George L. Nankervis Company
National Aniline Division, Allied Chemical & Dye Corporation
National Brass Company
National Cash Register Company, The
National Lock Company
National Plating Company, Inc., The
National Screw and Manufacturing Company, The
Nelson Chemicals Corporation
New England Buff Company
New England Plating Company, Inc.
New Jersey Zinc Company (3)
George E. Nichols Plating
G. J. Nicholas & Company, Inc.
Northwest Chemical Company
Northwestern Plating Works
Nutmeg Chrome Corporation
Oakite Products, Inc. (2)
Oneida, Ltd.
Packard Motor Car Company
Parker Rust Proof Company
Pennsylvania Salt Manufacturing Company, The
Perma-Line Rubber Products Corporation
Pheoll Manufacturing Company
Philadelphia Rust-Proof Company
Philco Corporation
Platers Supply Company
Plating Service Company
Precision Castings Company, Inc.
Price-Pfister Brass Manufacturing Co.
Products Finishing
Pronat Division, Poor & Company
R. C. A. Victor Division, Radio Corporation of America
Reilly Plating Company
R. W. Renton & Company
Reynolds-Robison Supply Company (2)
Richardson-Allen Corporation
Roberts Rouge Company
G. S. Robins & Company
Roto-Finish Company
Royal Plating & Polishing Company, Inc.
Sargent & Company
Scientific Control Laboratories
Scovill Manufacturing Company
J. P. Seaburg Corporation
E. E. Seeley Company, Inc.
J. J. Siefen Company
Sparkler Manufacturing Company
Standard Plating Rack Company
Standard Plating Works
Standard Steel Spring Company (3)
Stanley Works, The
Stevens, Frederic B., Inc.
Studebaker Corporation, The
George A. Stutz Manufacturing Company
Sunbeam Corporation
Superior Steel Company
Surface Alloys, Inc.
Sylvania Electric Products, Inc.
Talon, Inc.
Thomas Strip Div., Pittsburgh Steel Co.
Trico Products Corporation
Turco Products Corporation
Turner Brass Works, The
Udylite Corporation, The (3)
United-Carr Fastener Corporation
United Chromium, Inc. (2)
United Manufacturing Company
United Platers, Inc.
United States Spring & Bumper Company
Van Der Horst Corporation of America
Wagner Brothers, Incorporated
Wald Manufacturing Company
Walton & Lonsbury
Waterbury Plating Company
Weirton Steel Company
Western Electric Company
Western Rustproof Company
Westinghouse Electric Corporation
Wheeler Industries, Inc.
Whitfield Chemicals
Whitney Blake Company
S. K. Williams Company
Winchester Repeating Arms Company
Winters & Crampton Corporation
Wollensak Optical Company
Worcester Brass Electro Plating Company
Wyandotte Chemicals Corporation
Yale Polishers & Platers, Inc.
Yankee Metal Products Corporation

In Canada

Armalite Company, Ltd.
Bendix-Eclipse of Canada, Ltd.
Canada Skate Manufacturing Company
Canadian General Electric Company
Canadian Hanson & Van Winkle Company
Canadian Motor Lamp Company, Ltd.
John Galloway Company
John Inglis Company, Ltd.
International Nickel Company of Canada, Ltd.
Lea Manufacturing Company of Canada, Ltd.
Standard Sanitary & Dominion Radiator, Ltd.
The Steel Company of Canada, Ltd
F. B. Stevens of Canada, Ltd.
Thomas Buff & Brush Company, Ltd.
Tools & Hardware Ltd.
Union Screen Plate Company of Canada, Ltd.
W. W. Wells, Ltd.



NEW PASTE RACK INSULATION

New and improved; better than ever. Lasts longer. Easier to apply and of course costs less. These are things about BUNATOL Paste Insulation that every user should know. The super-toughness; the extra chemical resistance; plus a one-dip Primer coat which saves time and cost and gives wonderful adhesion.

BUNATOL Paste Insulation is 100% solids and without evaporating liquids. It is cured by heat to give this leather-like high gloss thick insulation that rinses freely and does not carry over solutions. Single dip means time is saved; a rack can be completely insulated in two to four hours, and in many cases the insulation will outlast the rack.

This new Paste insulation is used on electro plating and anodizing racks and fixtures; on work hooks and fixtures to stop marring and abrasion of the finished work; and in many other applications where its extreme chemical resistance and great toughness reduce operating expense. The improved BUNATOL Paste is making new records in results at lower cost. We manufacture BUNATOL in our factory so we have full control over its uniformity and quality.

Get all the facts. This new and improved insulation is interesting and we will gladly send you complete information on request.

Nelson J. Quinn Company
Toledo 7, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 276.

WHAT DO YOU LOOK FOR IN A BUFF?

IS IT COST? PRODUCTION? LONG LIFE? QUALITY?

It will pay you to find out what the *Pressure-Cooled* AIRFLOW buffs have to offer. Call your local representative or distributor. Warehouse stocks carried in principal cities

Write for your free copy of our new brochure, "The Key to Your Finishing Problems".

Manufactured exclusively by:

UNITED BUFF PRODUCTS CORP.

233 OAK STREET — Airflow — PASSAIC, N. J.

THE *Pressure Cooled* BUFF

NOTICE: The Airflow buffs and Arcon wheels are covered by U. S. and Foreign patents and patents pending. Any infringement will be subject to legal process.

USE READER SERVICE CARD; INDICATE A 277.

BUYERS *of any QUANTITY of the following SCRAP*

Ni—Anodes
Ni—Peelings . . . Strippings . . .
Nodules . . . Trees
Cr—Strippings . . . Nodules . . . Trees
Ni—Deposited on iron-hooks . . . Racks . . . Hangers
Tin—Plating Residues
Cadmium—Trees . . . Strippings . . . Nodules . . . Residues
Molybdenum—Tungsten
Gold—Silver
Platinum—Scrap . . . Residues . . . Strippings

Write indicating grade and quantity available

Distance no barrier

Prompt reply... favorable market prices

Metallurgical

ESTABLISHED 1909

PRODUCTS COMPANY

35th & Moore Sts., Phila. 45, Pa.

A. E. S. Directory

A. E. S. OFFICERS

President..... C. F. NIXON
11-104 General Motors Research Building "A"
485 W. Milwaukee Avenue, Detroit 2, Mich.

First Vice-President..... F. J. MacSTOKER
Farrand Optical Company, Inc.
4401 Bronx Boulevard, Bronx, N. Y.

Second Vice-President..... Dr. G. P. SWIFT
53 Galen Street, Watertown 72, Mass.

Third Vice-President..... Dr. R. A. SCHAEFER
Cleveland Graphite Bronze Company
17000 St. Clair Avenue, Cleveland 10, Ohio

Past President..... W. J. NEILL
Columbus Metal Products, Inc.
1341 Norton Avenue, Columbus 12, Ohio

Executive Secretary..... Dr. D. G. FOULKE
P. O. Box 168, Jenkintown, Pa.

A. E. S. RESEARCH COMMITTEE

Chairman..... Dr. DONALD PRICE
Oakite Products, Inc.
40 Thames Street, New York 6, N. Y.

Secretary..... The Executive Secretary

A. E. S. BRANCHES (Changes Only)

HAMILTON BRANCH meets third Thursday of each month in the Conference Room, West End Plant, Canadian Westinghouse Company, Ltd. Secretary, H. Fallowes, c/o Electroplating Division, Steel Company of Canada, Canada Works, Hamilton, Ontario, Canada.

INDIANAPOLIS meets first Wednesday of each month at Fox Steak House, 1207 E. Washington Street. Secretary, Edward Bruck, Platers Supply Company, 2311 Valley Avenue, Indianapolis 18, Ind.

NEWARK meets third Friday of each month at 8 P. M. in Hotel Robert Treat. Secretary-Treasurer, George Wagner, Hy-Grade Electro Plating Company, 35 Fourth Street, Newark, N. J. Research Finance Committee Chairman, Edwin Bowerman 166-41 17th Avenue, Whitestone, N. Y.

SOUTHEASTERN meets second Friday of each month in Robert Fulton Hotel, Atlanta, Ga. Secretary-Treasurer and Research Finance Committee Chairman, Dr. Fred W. Cox, Jr., Engineering Experiment Station, Georgia School of Technology, Atlanta, Ga.

SYDNEY, AUSTRALIA. Secretary-Treasurer, B. Bridgement, 19 Adelaide Street, Belmore, Sydney, N. S. W., Australia.

4 BIG REASONS WHY YOU SHOULD USE

STRIPODE

TO STRIP NICKEL

★Cuts acid consumption ★Reduces pitting and roughening
★Protects base metal ★Minimizes need for buffing and coloring

WRITE RIGHT NOW FOR MORE INFORMATION

THE CHEMICAL CORPORATION
54 Waltham Avenue
SPRINGFIELD • MASSACHUSETTS

Index to Advertisers

ALLIED RESEARCH PRODUCTS, INC. 116, 197
Agency: Emery Advertising Corporation
ALMCO DIV., QUEEN STOVE WORKS, INC. 184
Agency: Weston-Barnett, Inc.
AMERICAN CHEMICAL PAINT COMPANY 122
Agency: May Advertising Company
APOTHECARIES HALL COMPANY 185
Agency: Edward Owen & Company

BACON FELT COMPANY 171
Agency: Sanger-Funnell, Inc.
BAKER & ADAMSON PROD., GEN'L CHEM. DIV., ALLIED CHEMICAL & DYE CORP. 118
Agency: Atherton & Currier, Inc.
BAKER, M. E., COMPANY 186
BART-MESSING CORPORATION 183
Agency: Bass & Company, Inc.
BEAM-KNODEL COMPANY 178
BELKE MANUFACTURING COMPANY 125
Agency: Allbright Associates
BELMONT SMELTING & REFINING WORKS, INC. 188
Agency: Raf Advertising, Inc.
BLAKESLEE, G. S., & COMPANY 196
Agency: Lauesen & Salomon

CHEMICAL CORPORATION, THE 128, 204
Agency: Wm. B. Remington, Inc.
CHEMSTEEL CONSTRUCTION COMPANY, INC. 174
Agency: Smith, Taylor & Jenkins, Inc.
COWLES CHEMICAL COMPANY, THE 127
Agency: The Bayless-Kerr Company
CROWN RHEOSTAT & SUPPLY COMPANY 193
Agency: Shrout Associates

DAVIES SUPPLY & MANUFACTURING CO. 176
Agency: Batz-Hodgson-Neuwoehner Adv. Agency
THE DAYTON BRIGHT COPPER COMPANY 176
DIVERSEY CORPORATION, THE 158
Agency: Cruttenden & Eger Advertising
DUGGAN MASKING DEVICES 194
Agency: James E. Lillis Adv. Agency
DU-LITE CHEMICAL CORPORATION, THE 128
Agency: Charles Palm & Company

THE ELECTRIC PRODUCTS COMPANY 206
Agency: Robert G. Redhead Adv. Counsel
ENTHONE, INCORPORATED 109
Agency: Hugh H. Graham & Associates, Inc.

FEDERATED METALS DIV., AMERICAN SMELTING & REFINING COMPANY 177
Agency: John Mather Lupton Company, Inc.
FORMAN MANUFACTURING COMPANY 181
Agency: Brindley-Roth, Inc.

THE GRAV-I-FLO CORPORATION 191
Agency: Jones & Taylor & Associates
W. GREEN ELECTRIC COMPANY 136
Agency: Shappe-Wilkes, Inc.
GUMM, FREDERICK, CHEMICAL CO., INC. ..... 2nd Cover

HANSON-VAN WINKLE-MUNNING CO. 133, 156–157
Agency: O. S. Tyson & Company, Inc.
HARRISON & COMPANY, INC. 200
HARSHAW CHEMICAL COMPANY, THE 140
HOLLAND, J., & SONS, INC. 184
Agency: Norman D. Waters & Associates, Inc.
HULL, R. O., COMPANY, INC. 187
Agency: Ralph M. French Advertising

INDUSTRIAL FILTER & PUMP MFG. CO. 126
Agency: The Advertising Corporation
INDUSTRIAL PRODUCTS COMPANY 178
Agency: The Stewart-Jordan Company
THE IRONSIDES COMPANY 198–199
Agency: Mumm, Mullay & Nichols, Inc.

KOCOUR COMPANY 181
Agency: DeCasseres & Associates
KUSHNER, JOSEPH B. 180

LAND, L. J., INC. 178
LASALCO, INCORPORATED 175
Agency: Charles W. Bolan, Advertising
LEA MANUFACTURING COMPANY ..... 4th Cover
Agency: Sanger-Funnell, Inc.
L'HOMMEDIEU, CHARLES F., & SONS CO. 134

MAC DERMID, INCORPORATED ..... 3rd Cover
Agency: Harold F. Lewis Adv. Company, Inc.
MAGNUS CHEMICAL COMPANY 132
Agency: Spooner & Kriegel
MAGNUSON PRODUCTS CORPORATION 120
Agency: George Wilfred Wright
MEAKER COMPANY, THE 117
Agency: The Advertising Corporation
METAL & THERMIT CORPORATION 180
Agency: Raf Advertising, Inc.
METALLURGICAL PRODUCTS COMPANY 204
MICHIGAN CHROME & CHEMICAL CO. 113
MINNESOTA MINING & MFG. COMPANY 137
Agency: Batten, Barton, Durstine & Osborn, Inc.
MURRAY-WAY CORPORATION 179
Agency: F. B. Hubert Advertising Counsel
MUTUAL CHEMICAL CO. OF AMERICA 200
Agency: The House of J. Hayden Twiss

NELSON CHEMICALS CORPORATION 192
Agency: Blake B. Bradley
NORTON COMPANY 155
Agency: James Thomas Chirurg Company

OAKITE PRODUCTS, INC. 182
Agency: Rickard & Company, Inc.

PENNSYLVANIA SALT MFG. COMPANY 115
Agency: Geare-Marston, Inc.
POWERS REGULATOR COMPANY 180
Agency: Symonds, MacKenzie & Company, Inc.
PROMAT DIV., POOR & COMPANY 130–131
Agency: Russell T. Gray, Inc.
PURITAN MANUFACTURING CO. 206
Agency: Post, Johnson & Livingston, Inc.

QUINN, NELSON J., COMPANY 203
Agency: Wendt Advertising Agency

RAPID ELECTRIC COMPANY 173
Agency: Bertram Coren, Adv.

SARAN LINED PIPE COMPANY 111
Agency: MacManus, John & Adams, Inc.
SCHAFFNER MANUFACTURING CO., INC. 129
Agency: Edward M. Power Company, Inc.
SCHORI PROCESS DIV., FERRO-COMPANY CORP. 172
Agency: Harry Hurst Advertising
SEELEY, E. E., CO., INC. 176
SPARKLER MANUFACTURING COMPANY 135
Agency: Kreicker & Meloan, Inc.
STEVENS, FREDERIC B., INC. 138
Agency: Grant Advertising, Inc.
STORTS WELDING COMPANY, INC. 114
Agency: Harold S. Card
STUTZ, GEORGE A., COMPANY 206
Agency: Sander Rodkin Advertising Agency, Ltd.
SULPHUR PRODUCTS COMPANY, INC. 174

THE THERMAL SYNDICATE, LTD. 184
Agency: Asher, Godfrey & Franklin, Inc.
TRUE BRITE CHEMICAL PRODUCTS CO. 114

UDYLITE CORPORATION, THE 110
Agency: Grant Advertising, Inc.
UNIT PROCESS ASSEMBLIES, INC. 182
Agency: State Advertising Service
UNITED BUFF PRODUCTS CORP. 204
Agency: Gallard Advertising Agency, Inc.
UNITED CHROMIUM, INCORPORATED 119
Agency: Rickard and Company, Inc.
U. S. STONEWARE COMPANY 123
Agency: Ralph Gross Advertising, Inc.

WAGNER BROTHERS, INC. 121
Agency: Fred P. Bingham, Technical Adv.
WESLEY BLOCK & COMPANY 195
Agency: Claude Schaffner Advertising Agency
WILLIAMSVILLE BUFF DIV., THE BULLARD CLARK COMPANY 112
Agency: Gordon Schonfarber & Associates, Inc.
WIRE COATING & MFG. COMPANY 124
Agency: The Crier Advertising Service
WYANDOTTE CHEMICALS CORPORATION 170
Agency: Brooke, Smith, French & Dorrance, Inc.

ZIALITE CORPORATION 174

PUT AN END TO YOUR BURRING PROBLEMS

with PURICO "PUR-BUR"

PUR-BUR, new self-lubricating compound swiftly removes burrs, gouges, minute cracks—yet retains accurate finishes. Lasts longer and is more economical than ordinary polishing wheel.

Available in cake and tube form.

WRITE TODAY FOR COMPLETE INFORMATION

THE PURITAN MFG. CO.
WATERBURY, CONNECTICUT

USE READER SERVICE CARD: INDICATE A 281.

Assure lower-cost operation, higher operating efficiency and more dependable service. For detailed information, send in the coupon for Bulletin 20-210.

THE ELECTRIC PRODUCTS CO.
• 1721 CLARKSTONE ROAD • CLEVELAND 12, OHIO •

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____
X-72

Future Meetings

New York Branch, A. E. S., Annual Educational Session (2:00 P. M.) and Banquet (7:00 P. M.) on February 16 in Statler Hotel.

A. S. T. M. Spring Meeting and Committee Week in Hotel Statler, Cleveland, Ohio, on March 3–7.

Dayton Branch, A. E. S., Annual Educational Session and Banquet in Biltmore Hotel on March 15.

Chicago International Trade Fair on the Navy Pier, March 22–April 6.

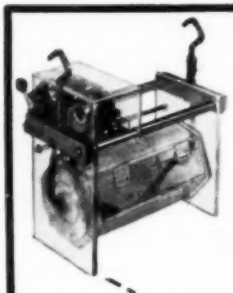
Boston Branch, A. E. S., 17th Annual Technical Session (2:00 P.M.) and Banquet (7:00 P.M.) on April 19 in Hotel Statler.

Rockford Branch, A. E. S., 10th Annual Educational Session and Banquet on April 26.

The Electrochemical Society's 50th Anniversary Meeting in Benjamin Franklin Hotel, Philadelphia, Pa., on May 4–8.

3rd Industrial Finishing Exposition and 39th Annual Convention of the American Electroplaters' Society in International Amphitheatre, Chicago, on June 16–20.

A. S. T. M. 50th Annual Meeting in Hotels Statler and New Yorker, New York City, on June 23–27.



STUTZ

"the original" Lucite Ribless Portable Plating Barrel

OUTSTANDING—

The best investment for your plating room!
6" x 12" —$203.50
8" x 18" —$302.50
with standard perforations of 3/32" or larger. Smaller perforations $8.00 to $28.00 extra.

STUTZ — your guarantee of quality

Order Today!

GEORGE A. STUTZ MFG. CO.
RIBLESS PRODUCTS
1645 CARROLL AVENUE CHICAGO 12, ILL.

"SEE HOW YOU CAN SAVE TIME AND MONEY WITH THESE IMPROVED COMPOUNDS"

MACDERMID BRIGHT COPPER PROCESS

Produces mirror bright deposits — easily chrome plated. Low metal bath — smooth deposits — 120° F — 140° F operating temperature. Write for Technical Bulletins.

METEX COPPER BRIGHT DIP

Chemical room temperature bright dip for copper. Aids in producing bright, lustrous chrome deposits directly on copper. Write for New Data Sheet.

ALUMETEX

Improved process for electroplating directly on aluminum which assures excellent adhesion and lustre for any electrodeposit on all commercially used alloys of aluminum. Write for Data Sheet No. 13.

ALUMINUM BRIGHT DIP

Improved, MacDermid, Inc. acidic formula developed to produce a brilliant lustre to most types of non-silicon aluminum alloys. Write for Technical Data Sheet No. 21.

ANODEX N.P.

This special variation of the original Anodex reverse current cleaner will give longer life — controlled foam blanket — non-popping. Write for New Data Sheet.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 284.

MAC DERMID
★ *Incorporated* ★
WATERBURY 20, CONNECTICUT

Thirty Years Service to The Metal Finishing Industry

LEA Copper Glo

with the Ronal High Speed Bright Copper Plating Process*

TOPS in Brightness plus Throwing Power and Plating Speed

We take it that you, as in the case with countless other platers, are interested in getting maximum production from your existing equipment. If your problem is one of obtaining a bright, soft copper with a minimum of tank tie-up time, LEA Copper Glo can solve this in a way you cannot afford to overlook.

LEA Copper Glo gives you brilliance with exceptional speed of deposition and excellent throwing power. Its high speed plating characteristics (Hull cell bright current density range 10-60 amperes/sq. ft. for standard formulations) permits production increases of from 30% to 60%, using existing equipment.

Plating minutes are valuable to you. Check up on Lea Copper Glo by the Ronal Process. In addition to brightness and high current density operation, it offers such added operating advantages as greater throwing power, ductile deposits, elimination of wetting agents and low copper concentrations.

* *The Ronal Bright Copper Process is a development of Ronal Chemicals Inc., Brooklyn, N. Y., for which process patents are pending.*

SAVE NICKEL

• • •

Chrome Plate Directly on LEA Copper-Glo Copper

...Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

THE LEA MANUFACTURING CO.
16 Cherry Avenue, Waterbury 20, Conn.

LEA MFG. COMPANY OF CANADA, LTD.
370 Victoria Street, Toronto 2, Canada

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 285.